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OFF-FARM EMPLOYMENT AND INCOME OF RURAL HOUSEHOLDS: THE CASE OF TAIWAN AND KOREA

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CHAPTER I

INTRODUCTION

Background

Until recently, off-farm employment by rural households had been largely ignored by development planners and theoreticians. Much of the empirical analysis concerning developing agriculture ignored the time rural households spent on activities not directly related to on-farm production, and the substantial amounts of income these activities generated. Persistent problems of underemployment, aggravated income inequality, and rural poverty, however, demand a rethinking of ways to improve the economic and social welfare of the rural poor. Land reform has had limited impact, the benefits of the green revolution have not been widespread, and industrialization has failed to effectively absorb the large numbers of underemployed found in many rural areas. Income has frequently become increasingly concentrated among rural households, while rural-urban income gaps have widened. Increased off-farm employment by rural households represents a development strategy largely ignored in most countries. Yet such employment may offer the best means of assisting the rural poor. This study analyzes off-farm employment with special emphasis on Taiwan and Korea. For several years these two countries have systematically collected large amounts of farm household data which present an analysis of off-farm employment not possible in other developing countries.

The current evolution in economic development strategies makes this study timely. During the past two decades, many countries have placed great emphasis on large-scale activities: large-scale, capital-intensive

firms in both the agricultural and nonagricultural sectors. A rethinking of this strategy is underway, as described in the next chapter, and increased attention is now being directed toward small-scale industrial firms and the broad range of rural nonfarm activities which provide a large amount of nonfarm employment. The research on which this new strategy is based is largely of two kinds: broad, aggregate studies showing the importance and growth of certain types of employment, and studies of the performance and problems of small-scale nonfarm firms. Migration and urban labor market studies focus on individuals that leave agriculture for full-time nonfarm activities. But little analysis exists of off-farm employment by persons who maintain some tie to agriculture. Some of these persons live and work off the farm most of the time but regularly send remittances back to the farm family. Others retain their primary employment on the farm and occasionally earn off-farm income. A better understanding of households with off-farm employment is required in order to assess how increased rural off-farm employment opportunities will affect farm household time allocation and income.

A rural development strategy designed to increase rural off-farm employment can make several important contributions. First, underutilized farm household labor can be employed at wage rates which exceed marginal returns to additional farm labor. Demand for farm labor is seasonal during off-peak seasons. Off-farm work may produce more income than additional on-farm work. Second, household members with lesser job skills may be able to satisfactorily perform certain farm tasks, thereby releasing other higher skilled family members for more off-farm work. Local unskilled labor may

even be hired for some of the farm work. Third, off-farm income may help stabilize family incomes by reducing some of the cyclical fluctuations normally found in farm incomes. Besides contributing to family security, income stability could have important impacts on family consumption and investment patterns. Fourth, off-farm income provides an additional source of household liquidity to finance farm production expenses, investments and consumption. This income can be mobilized by financial intermediaries for investment purposes, and can substitute for some short-term borrowings leading to greater self-financing of agriculture. Fifth, by reducing the need to migrate in order to reach desired income levels, some people may be retained in rural areas and contribute to creating and maintaining viable, attractive rural towns. Sixth, off-farm employment can provide on-the-job training and apprentice experience so job skills are increased for those that eventually choose to leave agriculture.

The extent to which these potential contributions will be realized in any country will depend on: a) government commitment to this type of strategy, and b) the response by farm households to increased off-farm opportunities. The available evidence suggests that farm households have responded by increasing the time allocated to off-farm employment, and developing a myriad of cottage industries and small-scale business activities. Little research has been done, however, to document the importance of such activities for the household, to predict household behavior in response to increased off-farm employment and wages, and to analyze the related impact on farm production and productivity.

This study has three objectives. The first is to review some of the recent literature in this area. One area of research concerns the role of small-scale industries and the broader category of rural nonfarm activities in economic development. Such research focuses on the demand for nonfarm labor. The other area of research reviewed covers off-farm employment and income of farm households. These studies concern the farm labor supply to nonfarm activities and include theoretical attempts to explain household labor supply and time allocation. This literature is reviewed to help evaluate the Taiwanese and Korean experiences.

The second objective is to examine the Taiwanese and Korean experience relative to off-farm employment. Economic and agricultural policies of these countries will be analyzed as they appear to affect participation in off-farm work. The evolution of farm and off-farm income of farm households will be reviewed. Multiple regression models will be estimated to evaluate how returns to labor, and selected farm and family characteristics are associated with off-farm earnings.

The third objective is to explore how economic policies and programs can be used to further off-farm employment opportunities as part of a rural development strategy. Relatively little documentation exists in this area, so much of the discussion must be speculative based on the findings of this and other research.

ORGANIZATION OF THE STUDY

This study is organized as follows. The next chapter represents a brief review of some of the recent research on small-scale firms and rural

nonfarm activities. This research suggests that such activities should be given increased attention in economic development planning. Chapter III reviews studies of off-farm employment and the theory of time allocation and multiple-job-holding. This theory provides the background for the empirical analysis of Taiwan and Korea. Chapters IV and V present the results of the analysis conducted for each country. Each chapter covers a summary of recent agricultural trends including farm and off-farm income, key policies which influence off-farm employment opportunities, and an identification of factors associated with off-farm earnings. Chapter VI summarizes the principle conclusions and policy implications of this study and identifies priority research needs. References are placed at the end with appendix tables.

CHAPTER II

RURAL NONFARM EMPLOYMENT IN ECONOMIC DEVELOPMENT STRATEGIES

This chapter presents a brief review of some of the economic development literature dealing with small-scale industries and rural nonfarm employment. The objective is to sketch some of the recent views of economic development theorists and practitioners. This chapter is meant to be illustrative of the ideas, not a comprehensive review of the literature. It emphasizes research dealing with Asia. Liedholm (1973) recently completed a careful review of employment literature dealing with Africa. The first section of this chapter briefly summarizes the origin of some of the ideas which dominated the literature during the past couple of decades and contributed to economic development strategies found in many countries. The second section discusses some arguments for a new strategy oriented towards the creation of more employment in rural areas. This literature is important because of the emphasis placed on the demand for labor in rural areas. The particular development strategy employed by a country will determine the potential for off-farm employment of farm households. Thus, this review provides background for the remainder of the study which focuses on the supply side of the labor market.

CAPITAL-INTENSIVE INDUSTRIALIZATION[1/]

A capital-intensive industrialization strategy has been pursued by several low-income countries during the past two decades. The strategy

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1/ This section draws heavily from Meyer and Larson (1978).

grew out of an understanding of how the economic growth process could be accelerated through intersectoral allocation of labor. The classical two-sector growth model, presented first by Lewis (1954)[2/] and later refined by Ranis and Fei (1961), provided some of the early economic development theory focusing on the process of labor absorption in a labor surplus economy. The model analyzes the process of growth in a dual economy composed of a capitalist and a subsistence sector. The capitalist sector is not restricted to manufacturing firms nor to private ownership, but in practice the policies of many countries focus almost exclusively on private manufacturing firms. The capitalist sector is assumed to use reproducible capital, pay capitalists for its use, and employ wage labor for profit. Conversely, the subsistence sector uses no reproducible capital, uses largely family labor, and the marginal productivity of labor may be zero in many cases. Output of the subsistence sector is shared so the marginal product of some workers may be below the average product received.

As growth occurs, the capitalist sector is assumed to invest and, through capital accumulation, create new employment opportunities. Labor is drawn from the subsistence sector; the supply is considered unlimited in that additional laborers are available at existing wage rates. This large pool of labor enables new firms to be created or old firms to expand without encountering shortages of unskilled labor. Eventually, however, the surplus labor is exhausted and the two sectors begin to compete for labor causing a rising wage rate. Nugent (1977) noted the model implies a

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2/ All references are listed at the end of this report.

perfect strategy for economic development through a smooth, equilibriating process of continuous marginal adjustments.

For policy purposes, the model suggests a strategy to accelerate growth. First, it suggests accelerating the growth and expansion of large-scale industrial firms which are expected to absorb the surplus labor. Secondly, these industrial firms are expected to have good growth potential since they produce goods with a high income elasticity of demand, whereas the agricultural and small-scale traditional manufacturing sectors are expected to face low demand elasticities. For these reasons many countries employ policies biased toward large-scale firms. Credit at highly subsidized interest rates is available to create and expand these firms, and finance working capital. Scarce foreign exchange is allocated to them through multiple exchange rate schemes or import licensing. Foreign assistance, which can be conveniently justified as a means to relax capital and foreign exchange constraints, is frequently channeled to these firms.3/ Technical assistance from both foreign and domestic sources is also largely given to this sector.

With the benefit of hindsight, we can now see how some of the problems currently faced by low-income countries resulted as a logical outcome from this strategy with a large-scale bias. Oshima (1971), Ho (1972) and Ho and Huddle (1975), amongst others, noted several of these problems: first, labor absorption has not kept pace with the increase in labor force and supply of labor from agriculture. An important explanation is the

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3/ Mellor (1976) presents a perceptive analysis of how U.S. foreign assistance to India in the 1950's and 1960's fit conveniently into Indian objectives to push capital-intensive projects. Tendler (1975) makes a similar argument for much of the assistance from bilateral and multilateral agencies.

cheapening of capital which results in the substitution of capital for labor and the selection of capital-intensive techniques. Labor is released from agriculture, either due to structural rigidities in the sector preventing access to land or due to labor displacement on large-scale, capital-intensive farms. This labor is forced into cities and contributes to high unemployment and urban problems.

Secondly, growth has tended to be concentrated in a few select geographic regions leading to increased interregional imbalances and a sharpening in the economic and social gap between urban and rural areas. Industries are concentrated in and around major cities. Through forward and backward linkages, these industries encourage other activities in close proximity. Furthermore, the social tension which arises among the un- and underemployed forces a diversion of resources into the provision of basic urban infrastructure and amenities.

Thirdly, income and wealth distribution have become increasingly concentrated.[4/] The distribution of wealth, and especially property, tends to be concentrated in the early stages of development. Under a capital-intensive development strategy, the share of national income received by labor relative to capital is unlikely to rise and offset the unequal incomes derived from wealth. Furthermore, employment opportunities are best for managers and skilled labor which command higher wages and salaries.

4/ Considerable controversy exists over whether or not increased income concentration is a "natural" feature of the early stages of economic development naturally followed by an improvement in distribution at larger stages of development (Wright, 1977).

Fourth, the larger subsistence sector is logically the only source (excluding the foreign sector) of capital for the smaller capitalist sector in the early stages of development. Thus, agriculture is squeezed to speed intersectoral capital flows. The failure to encourage production and investment in agriculture has often resulted in food shortages, rising food prices (and a demand for real wage increases in urban sectors), and the use of scarce foreign exchange for food imports. Subsidized food aid temporarily reduces price pressures but further discourages production.

Fifth, exports of goods in which low-income countries have a comparative advantage fail to reach their potential. Small-scale firms languish due to uncertain and expensive raw materials, scarce credit, and little technical assistance. Mellor (1976) analyzed how Indian textile exports stagnated during the 1950's and 1960's, while Japan, Taiwan and Korea aggressively expanded their market share.

These several problems have prompted a reevaluation of the capital-intensive industrialization strategy and a new strategy is emerging placing greater emphasis on small-scale, labor-intensive firms, rural nonfarm activities and farm-nonfarm linkages. The next section describes the basic elements of this new strategy.

Small-Scale Industries and Rural Nonfarm Activities

The work of several researchers contributes to the emerging interest in small-scale firms and rural nonfarm activities. Oshima (1971) found that small-scale industrial firms have several advantages over larger ones for a developing economy. Ho and Huddle (1975) emphasized the potential for labor absorption and exports by certain labor-intensive firms. Child

and Kaneda (1975) analyzed the potential of agricultural related firms in rural areas. Johnston and Kilby (1975), Mellor (1976), and Edwards (1977) stressed linkages between farm and nonfarm firms, and the effect of alternative strategies on these linkages. The World Bank recently published a report by Anderson and Leiserson (1978) which analyzed the entire range of rural and nonfarm activities.

A list of some of the reported characteristics of small-scale, labor-intensive firms follow. Some examples of the empirical support presented with the arguments are also included. This research refers largely to Asian experiences, and especially the success of Japan and Taiwan in wedding farm and nonfarm growth and development.

One of the most important issues concerns labor absorption. Anderson and Leiserson found 20 to 30 percent of the rural labor force primarily engaged in nonfarm work in many countries. The share was reported at 51 percent in Taiwan in 1966, 40 percent in the Philippines in 1970, and 25 percent in South Korea also in 1970. One-half to two-thirds of all nonfarm employment opportunities in Asia were found in rural areas and towns. Oshima found for the Philippines in 1961, firms engaging fewer than ten persons comprised 93 percent of employment in construction, 94 percent in commerce, 76 percent in manufacturing, 64 percent in transport and communications, and 95 percent in services. A similar situation was found in Taiwan the same year. For the manufacturing sector, firms with fewer than fifty persons employed 83 percent of the total in the Philippines in 1961, 60 percent in Taiwan in 1961, 51 percent in South Korea in 1966, and 79 percent in Thailand in 1964. Therefore, rural nonfarm activities

represent a substantial share of total nonfarm employment, while small-scale firms employ the largest share of total employment in several sectors.

The use of capital has also been studied. Oshima found that small-scale firms were less capital-intensive than larger units. Using value added per worker, he found that Philippine firms in 1971 with less than 10 workers had ratios one-sixth that of larger firms in manufacturing, two-thirds in construction and transport, one-seventh in commerce, one-half in mining and one-fourth in services. The manufacturing sectors in Taiwan, Thailand, and South Korea showed a similar result. Oshima argued further that much of the capital in small-scale firms is produced so there is less demand on capital and foreign exchange markets. Shinohara (1968) found capital intensity increased with firm size for all Japanese manufacturing industries studied in the mid 1950's.

The geographic dispersion of small-scale firms is greater than larger units. Oshima found in the 1961 Philippine census that only one-fifth of the persons employed in small firms were located in metropolitan Manila compared to one-half for large units. Likewise the 1966 South Korean census showed only 17 percent of the workers employed in units with less than ten employees worked in Seoul.

Smaller firms offer greater opportunities for family labor. For South Korea, Oshima reported that 19 percent of all persons employed in manufacturing firms with five to nine persons were proprietors and family members. The figure dropped to 9 percent for units with 10 to 19 persons and to zero for units with 100 or more persons. The Philippines data showed 49 percent for the share of family persons engaged in units with fewer than 10 persons and 22 percent for units over 10 persons. These small firms

provide opportunities for local entrepreneurs to gain experience. It is likely that many of the workers are the least educated and skilled in the nonagricultural sector. Thus, they have not required large human capital investments frequently needed to meet minimum skill levels of larger firms.[5/] Their employment improves income distribution even though small-scale firms pay average wages only one-half to two-thirds as high as larger units. Income distribution within agriculture is also improved because many low-income farm households earn substantial amounts of income from employment in rural nonfarm activities.

Small-scale nonfarm firms frequently have greater linkages with agriculture than larger firms. They are concentrated in the food, clothing, wood products, and leather industries which purchase large amounts of local raw materials. Some produce engines, pumps and other machinery sold to farmers, while others provide machinery repair, blacksmithing and other services. Johnston and Kilby show that the greatest demand for these goods comes from lower income landless workers and farmers. Likewise, when a labor-intensive agricultural development strategy is employed, local nonfarm firms are likely to provide most of the inputs. These linkages are less significant when a capital-intensive agricultural strategy is employed and many of the inputs are imported.

Finally, there is evidence of export potential for certain small-scale firms. Some researchers agree with Tyler's (1976) view that industrialization

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5/ Migration studies such as Lee's (1976) frequently find a direct relationship between educational achievement and propensity to migrate. It is argued that better educated migrants face a greater urban-rural income disparity and a higher probability of obtaining employment.

and export of manufactured goods is unlikely to substantially increase labor absorption and foreign exchange earnings. Ho and Huddle are more optimistic, however, based on their research of 81 commodities that: (1) were produced or producible by small-scale, traditional industries, and (2) were traded or tradable on the international markets. All were goods with a high labor content. Using import data from the U.S. and fifteen OECD countries, they found import demand elasticities far above unity and the rate of expansion in trade of these commodities from 1964 to 1970 averaged 11.6 percent per annum compared to 9 percent for all manufactured goods. They argue that handmade, nonstandardized goods become more appealing than mass-produced goods to middle income consumers with rising incomes. Thus, this subset of firms producing handmade goods has good export potential.

IMPLICATIONS

The literature summarized above sketches some of the principal arguments concerning the appropriate development strategy for low-income countries. It is argued that the past emphasis on large-scale, capital-intensive firms has been overdone. Problems of unemployment, income inequality and rural poverty require increased attention on small-scale firms and rural nonfarm activities. These activities are believed to absorb more unskilled labor, use less capital and foreign exchange, consume domestic rather than imported raw materials, and have closer linkages to the agricultural sector. Japan and Taiwan are frequently given as examples where this strategy was successfully employed.

Rural employment opportunities are expected to increase when small-scale firms and rural nonfarm activities are encouraged. Some jobs will likely be absorbed by people who will migrate to small towns and villages. Increased remittances to their rural families will likely result. Moreover, members of rural households will find increased part- and full-time employment off the farm. The distribution of these jobs will influence rural incomes and income distribution. If these jobs go primarily to households with low farm incomes, rural poverty will be reduced and rural income distribution improved. The pattern and distribution of off-farm employment and income among farm households is the subject of the remainder of the report.

CHAPTER III

STUDIES OF OFF-FARM EMPLOYMENT AND TIME ALLOCATION OF RURAL HOUSEHOLDS

This chapter reports on research related to off-farm employment. The first section presents descriptive information on selected countries to show the importance of off-farm employment and income for farm households, trends in such income, and the distributional patterns of off-farm income. The second section presents a theoretical framework to explain time allocation of farm households by analyzing on- and off-farm wage rates and selected farm and family characteristics. This theory provides the background for the empirical analysis of Taiwan and Korean farm households reported in Chapters IV and V.

OFF-FARM INCOME OF RURAL HOUSEHOLDS

This section summarizes studies of off-farm employment and income of rural households in seven countries. Few countries collect comprehensive data on sources of farm household income and time spent on various activities. The studies cited were some of the best found in the literature in terms of comprehensive data. Explicit comparisons among countries based on these types of studies must be made with care. In many low-income countries, analyses have been limited to intensive case studies of selected areas, which creates the obvious problem of sample bias. Also, farm classification systems often vary between countries. For example, any farm household in Japan with one or more members engaged in work off the farm is considered part-time, even if all other household members work on the farm. Likewise, income definitions vary.

Some studies analyze gross rather than net income. Further, income from activities like forestry products, fishing and cottage industries not directly related to crop and livestock production may be treated as farm income in one country and off-farm income in another.

United States

Farmers in the U.S. spend large amounts of time working off the farm. Off-farm work, measured as days worked per year, has steadily increased. Thus, off-farm earnings provide a major proportion of farm household income. By 1969, 55 percent of farm operators reported some off-farm work (OECD, 1977). Fourteen percent reported working under 100 days per year, eight percent worked 100-199 days and 32 percent worked over 200 days. A comparison of 1964 and 1969 showed that off-farm work days increased for all farm sizes where size was determined by value of farm sales.

The importance of off-farm income for total household income can be analyzed in terms of gross and net income (Appendix Table 1). Off-farm income has ranged from 18 to 23 percent of farm receipts and 43 to almost 59 percent of net income from 1960 to 1976. The proportion of off-farm income was high in the period 1967 to 1971, then fell as farm income accelerated in the mid 1970's due to high commodity prices, then rose again as average farm income peaked in 1974.

The share of off-farm income in household income is inversely related to farm size but there has been a steady increase in that share for all farm sales categories (Table 1). The proportion of off-farm income to gross household income rose from 60 to 80 percent from 1960 to 1976 for farms with less than $2,500 in farm sales. Farms with sales of less than $10,000 earned less than 50 percent of gross income from off-farm sources.

TABLE 1: Proportion of Off-Farm Income in Total Household Income by Value of Farm Sales Classes[a/], United States, 1960, 1965, 1970 and 1976

Farm Sales Class	Year			
	1960	1965	1970	1976
Less than $2,500	61.1	70.7	76.0	81.4
$ 2,500 - 4,999	27.7	40.3	53.1	62.6
$ 5,000 - 9,999	15.2	25.7	35.2	47.0
$ 10,000 - 19,999	7.3	11.9	18.4	28.1
$ 20,000 - 39,999	5.3	7.3	8.9	14.8
$ 40,000 - 99,999	N/A	5.3	5.4	9.3
$100,000 and over	N/A	2.4	2.2	3.4

Source: Computed from Farm Income Statistics, Statistical Bulletin No. 576, ERS/USDA, Washington, D.C., July 1977.

a/ Total household income was the sum of farm and off-farm income. Farm income was defined as realized gross farm income including cash receipts from marketings, government payments, nonmoney income, and other income including machine hire and custom work. Off-farm income includes wages, salaries, business income, interest, transfer payments, nonfarm rent, dividends and royalties.

When net household income is considered, farms with less than $20,000 in sales earned less than 50 percent of their income from farm sources in 1975 and 1976.

The source of off-farm income has been studied through the analysis of income tax returns (Larson and Carlin, 1974). In 1969, a higher proportion of high income households reported wage and salary earnings than lower income groups. Often, wealthy taxpayers were well-off because off-farm income compensated for low farm profits. The most affluent groups had nonfarm businesses and other investments. The poor, on the other hand, relied mainly on wage and salary earnings. The amount averaged only $860 suggesting that most worked only part-time. It was found that between 1963 and 1969, the nonfarm economy did more to improve the economic status of farmers than did changes in the farming sector.

Income distribution has been analyzed for U.S. farms. Carlin (1973) analyzed 5,649 observations included in a special agricultural survey in 1966. He found a Gini ratio of .475 for household money income including both farm and off-farm sources. Income of nonfarm families tended to be less concentrated,[6/] but when net worth was added to income, the two sectors were more similar in distribution of well-being. Older farm families had even more unequal income distributions, but many with low incomes had substantial net worth.

Hanson and Spitze (1976) studied 1,400 Illinois farmers in 1971. They found large amounts of off-farm income and the pattern of earnings

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6/ Boyne (1965) arrived at a similar conclusion in an analysis of the 1948-1963 period.

followed the national data reported above. Farmers 65 years or older earned the lowest amount of farm and off-farm income. Off-farm earnings were positively related to education, farmer's health, family size, and distance travelled to off-farm work.

Japan

The Japanese case is particularly interesting for three reasons. First, it has essentially become a country of part-time farmers. Second, some analysts believe there are enough similarities among countries that several key features of the Taiwanese and Korean economies can expect to follow the pattern set by Japan in its development. Third, Japan has a high man-land ratio; thus it's example may be more relevant for some low-income countries than, say, the U.S.

Misawa (1969) reported that part-time farming is a relatively old Japanese phenomena. During and after World War II, problems of small average farm size and limited farm enlargement coupled with good off-farm employment opportunities contributed to an increase in part-time farming. Table 2 gives the trends from 1950 to 1974 in distribution of farm households. Part-time farm households have one or more family members engaged in off-farm work. Part-time farms grew from 50 percent of the total in 1950 to almost 88 percent by 1974. In 1974 almost two-thirds of these part-time farms earned more off-farm income than net farm income.

Appendix Table 2 shows a steady increase in proportion of average household receipts earned from nonagricultural sources. These sources represented almost 50 percent of average household receipts in 1960 and more than 60 percent in the 1970's. No other country reports farm households

TABLE 2: Distribution of Farms by Type, Japan, 1950-1974[a/]

	Years				
	1950	1960	1970	1973	1974
Number of Farm Households ('000):					
Total	6,176	6,057	5,342	5,100	5,027
Full-Time	3,086	2,078	832	675	628
Part-Time	3,090	3,978	4,510	4,425	4,399
Class I	1,753	2,036	1,802	1,303	1,222
Class II	1,337	1,942	2,709	3,122	3,177
Percentage Distribution (%):					
Full-Time	50.0	34.3	15.6	13.2	12.5
Part-Time	50.0	65.7	84.4	86.8	87.5
Class I	28.4	33.7	33.7	25.6	24.3
Class II	21.6	32.0	50.7	61.2	63.2

Source: OECD (1977), p. 7.

a/ Farm household = farm family that operates at least 0.3 ha. in Eastern Japan or at least 0.05 in Western Japan, or annual sales of farm products of at least 50,000 yen.

Full-time household = no family member is engaged in off-farm work.

Part-time household = one or more family members is engaged in off-farm work.

Class I part-time households = net farm income exceeds off-farm income.

Class II part-time households = off-farm income exceeds net farm income.

with such a high share of nonagricultural income. Kato and Izumida (1977) reported source of income by farm size (Table 3). In 1960, farms with less than 0.5 hectares earned 80 percent or more of total income from nonagricultural sources, and that proportion grew to almost 90 percent by 1973. Similarly, farms with more than 2 hectares earned about 14 percent of their income from nonagricultural sources in 1960 and that share more than doubled to 30 percent in 1973.

Nonagricultural income has made an important impact on income distribution. The gap between rural and urban incomes has declined, in part, because farm households have multiple sources of income. Income distribution has also improved within agriculture. Households with over 2 hectares of land earned more than twice the family income of households with less than 0.5 hectares in 1960. By 1973, they were earning only 1.5 times as much. During that 13 year period, the small farms increased agricultural incomes slightly faster than the larger units, while the reverse was found for nonagricultural income. Thus, average family incomes tended to converge.

The persistence of part-time farming in a rapidly industrializing country is surprising. There has been little farm size enlargement even though average farm size is only about one hectare. Many of the part-time farms are worked by old people and wives, while husbands are employed off the farm. Kato and Izumida argue that instability in urban jobs, an inadequate social security system, and the value of land as a hedge against inflation discourage part-time farmers from giving up their land so full-time farmers can expand.

TABLE 3: Nonagricultural Incomes for Rural Households, by Farm Size, Japan, 1960 and 1973

Farm Size Class (has.)	Proportion of Nonagricultural Income[a] in Total Household Income	
	1960	1973
Less than 0.3	90.3	88.9[b]
0.3 - 0.5	79.9	
0.5 - 1.0	51.6	68.5
1.0 - 1.5	28.4	47.6
1.5 - 2.0	21.9	38.6
2.0 and above	13.6	29.9
Average	49.7	64.3

Source: Kato and Izumida (1977).

a/ Includes remittances, gifts and other sources.

b/ Less than 0.5 has.

Indonesia

Hart (1977) analyzed detailed data on time allocation in a sample of 87 households in a village located in the northern lowland plain of Central Java. The predominant economic activities were irrigated rice, fish ponds and fishing. The sample included households with land and landless laborers. The households were divided into three classes: Class I included the wealthiest households which owned and operated at least 0.5 hectare of rice land; Class I households controlled less than 0.5 but more than 0.2 hectares of rice land; Class III households controlled less than 0.2 hectares and included many with no land.

The households were interviewed each month for a year and data presented for a month with peak demand for rice field labor and a month in the slack period before harvest. Table 4 presents the results. Own production includes work with production assets owned by the household including rice land, fish ponds, home gardens and livestock. Wage labor was largely agricultural related to rice, fish or sugar cane production. The searching category included largely fishing, vegetable and fuel gathering. Trading included a small group of women buying groceries from an adjacent town for local resale, selling village produce, and a few rice traders largely operating outside the village.

The data show an inverse relationship between wealth and hours worked. Individuals in Class III households tend to work substantially more hours than the other two groups in both peak and slack periods. Households in the three classes reported working in all four activities, but there were substantial differences in relative allocation of time. Class I households spent about 70 percent of the total income earning hours on own production

TABLE 4: **Inter Class Differences in Household Labor Allocation Among Income Earning Activities and Housework**

	Class averages	(Hours per Month)* Own production	Trading	Wage labor	Searching activities	Total income earning activities	House work	Total
Peak month								
Class I	Hours/household	289.1	44.9	64.7	6.8	405.5	159.9	565.4
	Hours/person 10+**	75.9	11.8	17.0	1.8	106.4	42.0	148.4
	% allocation	51.5%	7.9%	11.4%	1.2%	71.7%	28.3%	100%
Class II	Hours/household	114.3	45.3	278.3	83.4	521.2	124.7	645.9
	Hours/person 10+	31.1	12.3	75.7	22.7	141.7	33.9	175.6
	% allocation	17.7%	7.0%	43.1%	12.9%	80.7%	19.3%	100%
Class III	Hours/household	20.2	12.9	390.5	62.7	486.3	103.1	589.4
	Hours/person 10+	6.4	4.0	123.1	19.8	153.3	32.5	185.8
	% allocation	3.4%	2.2%	66.2%	10.6%	82.5%	17.5%	100%
Slack month								
Class I	Hours/household	315.6	39.4	23.6	20.9	399.5	166.7	566.2
	Hours/person 10+	83.9	10.5	6.3	5.6	106.2	44.3	150.5
	% allocation	55.7%	7.0%	4.2%	3.7%	70.6%	29.4%	100%
Class II	Hours/household	87.0	60.7	164.9	131.9	444.6	126.2	570.8
	Hours/person 10+	23.7	16.5	44.8	35.9	120.9	34.3	155.2
	% allocation	15.3%	10.6%	28.9%	23.1%	77.9%	22.1%	100%
Class III	Hours/household	27.6	8.6	243.0	187.0	466.1	107.9	574.0
	Hours/person 10+	9.2	2.8	81.0	62.3	155.4	36.0	191.4
	% allocation	4.8%	1.5%	42.3%	32.5%	81.2%	18.8%	100%

*Including travelling time but excluding child care. **i.e. hours per person aged 10 or more.

Source: Reproduced from Hart (1977), p. 33.

due to their control over more land and fish ponds. Conversely, Class III households spent 80 percent of their time in wage labor. Wealthier households spent proportionately more time in trading. Hart also noted that women perform most of the housework, but there is a clear tendency for women in poorer households to spend relatively more time in income earning activities.

An interesting pattern of time allocation was noted relative to returns to labor. A slight increase in average wage rates for male wage labor was associated with a large decline in hours worked. Men in Classes II and III worked as many hours as possible in the more remunerative types of wage labor, mainly fish ponds. In slack seasons, Class III men were forced to work in lower wage jobs. As wages declined, men switched to fishing which provided a riskier but higher yielding income. Women in Class II withdrew heavily when wage rates declined, while Class III women continued to work long hours in low paying sugar cane and harvesting activities outside the village.

Hart suggested that the elasticity of labor supply to off-farm activities may be quite high, especially for the small landowning-operating group. It is likely that this group would have greater access than the landless group to any expansion of employment opportunities. Furthermore, given the large population of small landowners and landless laborers, an increase in aggregate labor demand would have to be massive if labor markets were to tighten and wage rates rise significantly.

Birowo (1975) studied a sample of farm households in 9 major rice growing areas of Western Java in 1973-74. He divided the sample by farm size and level of liquidity. Farming appeared to be the most remunerative activity

and off-farm work was used to compensate for low farm income. Like Hart, he found that the importance of off-farm work declined as farm size increased. When members of large farm households worked off the farm, they worked at jobs that paid substantially higher remuneration than small farms.

Thailand

Fuhs and Vingerhoets (1971) reported survey results for four rural areas in Thailand. Ninety-five households were studied during the 1969-70 agricultural year. The villages selected were generally representative of the agricultural regions in which they were located.

Average farm and nonfarm incomes of the households and labor allocation are reported in Table 5. Nonfarm income, as a proportion of total net household income, varied from 14 to 32 percent. The time reported in farm work represented about half of total work time, while cottage industries and off-farm work represented 20 to 30 percent of total work time. Comparing the income share with the proportion of time suggests that off-farm work may return somewhat lower returns to labor. In Ayutthaya, most nonfarm income was earned as wage and salary income. Likewise in Khon Kaen, construction work on an irrigation project provided off-farm employment. The Chiang Mai sample included blacksmiths, carpenters, shopkeepers, and workers in tobacco kilns. Several households operated weaving looms. Cottage industry was important in Phu Wieng in the form of silk weaving, and basket and hat making.

The authors concluded that the source of nonfarm earnings was related to the nature of nonagricultural employment opportunities. Households in villages with good agricultural potential and access to markets were found

TABLE 5: Source of Farm Household Income and Distribution of Time, Thailand, 1969-70

Item	Area of Thailand			
	Ayutthaya[a]	Chiang Mai[b/]	Khon Kaen[c/]	Phu Wieng[d/]
Average Household Income (Baht):				
Net Farm Income	11,582	5,881	8,171	5,237
Nonfarm Income	1,950	2,742	2,427	1,956
Percent Nonfarm	14.4	31.8	22.9	27.2
Percent Distribution of Total Hours Worked:				
Farm Work	54.5	49.2	51.2	55.8
Domestic Work	22.2	23.2	17.1	15.9
Cottage Industry	0.8	8.3	12.2	18.0
Off-Farm Work	22.5	19.3	19.5	10.3

Source: Fuhs and Vingerhoets (1971).

a/ Three villages in Ayutthaya in the central plain.

b/ Three villages in Chiang Mai in the north.

c/ One village in Khon Kaen, and one in Nam Phong in the northeast.

d/ Two villages in Khon Kaen in the northeast.

to adopt new farm and off-farm activities to off-set normal seasonal farm employment patterns. However, villages in poorer, more remote areas followed more traditional production patterns, and some farmers work as hired laborers in more prosperous lowland villages. Households in these poorer areas were also found to utilize a smaller proportion of their total available household labor supply.

Nigeria

Norman (1973) studied three Moslem villages in Northern Nigeria. Land is held communally, and although there is wide variation in average farm size operated, there is little landless labor. Peak season labor bottlenecks have been identified as important constraints to more intensive land use.

A total of 42 farm families in the village of Dan Mahawayi were studied for the period April, 1966 to March, 1967. Households were selected randomly and interviewed twice weekly. For analysis, the families were divided into two strata: small farms included 19 families with less than 1.5 acres per resident, and large farms included the remaining 23 families with 1.5 acres or more per resident. An additional 62 families were studied in the villages of Hanwa and Doka. All 104 families were analyzed together for part of the analysis.

Table 6 reports some of the findings. Large farms used considerably less labor per cultivated acre compared to small farms. According to Moslem tradition most of the farm labor is performed by men. Adult males on small farms worked more days in both farm and off-farm work than males in large farms. In both groups of farms, off-farm work represented about 47 percent of the total work days. When all three villages were analyzed together, the

TABLE 6: Farm Family Labor Utilization and Income in Three Villages in Northern Nigeria, 1966-67

Item	Dan Mahawayi Small Farms	Dan Mahawayi Large Farms	Average Three Villages
Man-Hours of Labor per Cultivated Acre[a/]	216.0	144.9	240.2
Days Worked per Year by Male Adults:			
Family Farm	146.2	136.3	141.1
Off-Farm	130.6	117.7	82.8
Total	276.8	254.0	223.9
Percent Composition of Off-Farm Occupations:			
Traditional:			
Manufacturing[b/]	22.6	20.3	19.1
Services[c/]	41.4	39.0	31.3
Trading	35.6	34.7	22.3
Modern: Services[d/]	0.4	6.0	27.3
Net Farm Income (U.S. Dollars)	119.3	300.9	221.5
Off-Farm Income	61.4	73.7	70.7
Total Farm Income	180.7	374.5	292.2
Percent Off-Farm	40.0	19.7	24.2

Source: Norman (1973), p. 11 and 26.

a/ The physical productivity of individuals varies according to age and sex. On the basis of this, one hour of work by different individuals was evaluated in terms of man-hours as follows: Small children 0-6 years old = 0.00, large children 7-14 years old = 0.50, male adults 15-64 = 1.00, female adults 15-64 = 0.74, and men and women 65 years old or more = 0.50. The figure does not include time spent travelling to and from the fields.

b/ Includes blacksmiths, tailors, carpenters, spinning, leather working and making pots, cigarettes, mats and sugar, etc. Average remuneration per day worked was 0.4 dollars.

c/ Includes tending own house (fencing, building, thatching, cutting grass and firewood), barbers, butchers, hunting, begging, washermen, public officials, Koranic teachers, etc. Trading can also be classified as a traditional service. Average remuneration per day worked was 0.3 dollars.

d/ Includes commission agents, messengers, laborers, nightwatchmen, bicycle repairers, buying agents, etc. Average remuneration per day worked was 0.6 dollars.

total number of work days fell and the proportion off-farm fell to 37 percent. The type of off-farm occupation also varied among the villages. Dan Mahawayi was geographically more isolated than the other two villages and most off-farm work was in traditional activities. In the other two areas, however, a much larger proportion of the off-farm work was in more modern services with higher levels of remuneration.

For the three villages, off-farm income represented almost one-quarter of total farm income. The proportion for small farms was 40 percent. An approximation of off- and on-farm wage rates can be made by dividing off- and on-farm income by the respective number of work days. The resulting off-farm wage rate varied from 1/3 to 1/2 of the on-farm rate. The daily off-farm rate for the small farms was only 0.47 dollars compared to 0.62 for large farms. The average off-farm rate for all three villages was 0.85 due to the higher returns earned in more modern activities. These wage rate differentials between farm and off-farm work suggest that off-farm work may not be that attractive but is necessary to meet consumption levels.

A surprisingly large amount of off-farm work was reported even during periods of peak demand for farm work. Norman suggested that part of the explanation could be the need to earn cash income during periods of the year when family food stocks were low. Thus, it appears that off-farm activities make an important contribution to maintaining farm consumption levels during periods of low farm income.

Sierra Leone

A group of researchers at Michigan State University has conducted a series of studies on the rural economy of Sierra Leone. Some of the principle findings are summarized in Byerlee, et al. (1977). The results showed

that, unlike Nigeria, a smaller proportion of farmers engaged in nonfarm activities. Only 11 percent of the farmers engaged in nonfarm activities as a secondary occupation. Furthermore, a survey of males in rural villages revealed that approximately 80 percent classified their primary occupation as agriculture or fishing. Thus, approximately 30 percent of the rural population earn some income from nonfarm work.

The seasonal variation in farm work noted by Norman in Nigeria was also found in Sierra Leone. However, farmers appeared to more fully adjust off-farm work to these seasonal variations. The survey showed that 19 percent of the male labor hours of farm households were devoted to nonfarm activities during the slack agricultural month but only 2 percent during the peak agricultural month. The results for Nigeria and Sierra Leone suggest a fluid labor market in which farmers attempt to adjust their nonfarm labor market supply over a fairly wide range in response to agricultural labor demands.

Egypt

Hansen (1969) reported results of a rural employment survey conducted in Egypt during the period of March 1964 to February 1965. Four hundred and eighty households from 48 villages were selected for analysis. Two out of the ten households selected from each village were nonagricultural. All activities lasting more than half an hour were recorded but household work was not included.

A striking result of this survey was the large number of hours worked per year by all categories of rural labor (Table 7). Men worked an amount of time approximately equivalent to an eight hour day, women about a third

TABLE 7: Average Annual Working Hours by Sex-Age Groups, Types of Households, and Types of Work, Egypt, 1964-65

Type of Household	Sex-Age Group	Number of Hours Worked Annually	Percent of Annual Work Time Spent On: Farm Work[a]	Processing and Other[b]	Non-agricultural Work
Farmers	Men[c]	2,280	74	16	10
	Women[c]	869	82	14	4
	Children[d]	1,022	88	8	4
	Total	1,642	78	14	8
Farm Laborers	Men	2,324	71	14	15
	Women	904	66	12	22
	Children	1,374	78	9	13
	Total	1,716	71	13	16
Nonagricultural	Men	2,482	12	6	82
	Women	697	43	8	49
	Children	1,087	51	3	46
	Total	1,738	21	5	74

Source: Hansen (1969), Table 1.

a/ Field work and animal husbandry.

b/ Processing farm products and other agricultural work.

c/ Persons fifteen years and older.

d/ Males and females ages six to fifteen.

of a day, and children about half a day. Earlier estimates of farm labor surplus failed to account for the large amount of time spent on activities not directly related to field work. Nonagricultural work referred to work off the farm generally as hired labor. Men classified as farmers spent 10 percent of their time in nonagricultural work, and the proportion was higher for farm laborers.

The relationship between off-farm work and size of farm and family for agricultural households can be seen in Table 8. No clear pattern of differences in working hours for men emerges across farm or family size. Nor was there any pattern for total working hours of women or children. There was a clear pattern for work off the farm however. As would be expected, about one-third of the time of women and more than two-thirds of the men and children in the landless categories were spent off the farm. That proportion falls sharply as farm size increases but still represents a substantial portion of time, especially for men and children. Family size tends to increase off-farm work. For example, men on 1/2 to 2 feddan farms spent 18 percent of their time on off-farm work in households with three and less working members, but 33 percent in households with more than three. The respective proportions were 4 and 14 for 2 to 5 feddan farms, and 3 and 5 percent for more than 5 feddan farms. The work time of children followed a similar pattern. In three out of the four farm size strata, however, the off-farm time of women declined with increased family size.

Hansen also noted that work outside the farm followed a seasonal pattern determined by farm work. He concluded there was a real choice between work on and off the farm so the marginal productivity of farm work is not

TABLE 8: Total Hours Worked and Proportion[a/] Off-Farm by Age-Sex Groups, Egypt, 1964-65

Size of Farm	Number of Working Family Members	Men		Women		Children	
		Hours Worked Per Year	Percent Off-Farm	Hours Worked Per Year	Percent Off-Farm	Hours Worked Per Year	Percent Off-Farm
Landless[b/]	3 and less	2,444	69	838	35	1,374	80
1/2 to 2 feddan	3 and less	2,384	18	906	4	1,070	14
2 to 5 feddan	3 and less	2,420	4	1,112	5	1,096	9
5 or more feddan	3 and less	2,062	3	834	6	1,702	2
Landless[b/]	more than 3	2,208	73	948	30	1,374	65
1/2 to 2 feddan	more than 3	2,190	33	1,010	9	1,122	34
2 to 5 feddan	more than 3	2,230	14	794	2	1,020	14
5 or more feddan	more than 3	2,358	5	734	1	848	11

Source: Hansen (1969), Table 2.

a/ The percentages for work outside own farm were calculated on family members with at least 30 days recorded work.

b/ Less than 1/2 feddan or no land at all.

likely to be below the level of rural wages. It was noted that some larger farms hired women and children for low paying tasks like cotton picking and weeding at the same time as men on the farm took higher paying off-farm work. Finally, wages seemed to follow supply and demand conditions, so an active labor market appeared to exist with little evidence of large amounts of unemployed farm labor.

Summary

These studies of off-farm employment and income are far from conclusive regarding this important dimension of rural welfare. The findings, however, suggest some similarities and patterns among countries. A fairly active labor market appears to exist in most rural areas. Members of farm households frequently work both on and off the farm and off-farm earnings make a significant contribution to total household income. Adult males and females and children are observed to work off the farm. Little un- or underemployed labor appears to exist where off-farm employment opportunities are available.

Farmers work off the farm for different reasons. In some areas, off-farm work appears to be highly remunerative so there is likely to be competition for labor between on- and off-farm work. In other areas off-farm work appears to pay a return lower than the return to farm work. In these cases, off-farm work may be undertaken largely in slack periods to supplement low farm incomes. Thus, it appears that farm households are sensitive to relative wage rates and allocate labor where it will earn the highest return. Generally, off-farm income tends to be negatively correlated with farm size. This tends to suggest that farm work is frequently preferred to off-farm work, and when the land/man ratio is high, farm labor requirements absorb most of the family labor.

THEORIES OF TIME ALLOCATION AND MULTIPLE JOB HOLDING[7/]

This section summarizes some of the recent literature dealing with theoretical models to explain time allocation and their use in analyzing multiple job holding. Extensions of these models have been used to analyze the supply of off-farm work by members of farm households.

Simple Work-Leisure Model

The simple work-leisure model originated with Robbin (1930) and Hicks (1956). It provided the principles for the subsequent work of Mincer (1962) and Becker (1965) which has guided much of the subsequent thinking on time allocation. The allocation of time is viewed as an extension of consumer theory where the consumer desires consumption commodities (Z's) produced by combining purchased goods (X's) and home production time (t). The worker purchases some goods to combine with his home production time. Income is earned by work where the wage rate received is equal to the opportunity cost of time. The worker then allocates his total time between work for wages and household production and/or leisure.

Wage rate changes influence time allocation. If home time is assumed to be a normal good, the worker experiences an income effect when the wage rate rises resulting in an increased demand for home time. The worker also experiences a substitution effect in which he substitutes increased expenditures on goods for time.

7/ This section draws heavily from the research review conducted by Dwight Smith in his unpublished research proposal, "The Determinants of the Off-Farm Labor Supply by Small-Farm Household Members: The Case of Laguna, Philippines," February 1978, and Mei-Yu Wu's unpublished M.S. thesis entitled, "A Study of Off-Farm Work by Taiwanese Farm Households," April 1978.

Farm Operator's Time Allocation Between Farm and Off-Farm Work

A number of assumptions are required when the simple work-leisure model is applied to the analysis of a farm operator's allocation of time. The basic assumption is that the farm production function is subject to diminishing marginal physical product, which is not the case with the off-farm activity. Further, it is assumed that the farm has a given stock of capital, land, labor, etc.; the farm production function is independent of the off-farm allocation of time; the household planning horizon is a single period; the farmer's indifference curves between on-farm time and off-farm time are identical; and flexible hours are in off-farm work.

Suppose the farm operator's primary job is farming as shown in Figure 1. U_1 and U_2 represent a set of indifference curves between leisure and income. The curve DCHA represents the operator's farm earnings function. In the absence of off-farm work opportunities, the operator achieves maximum utility at point H. He will work DF on the farm, spend FO in leisure, and earn FH earnings from farming.

Assume off-farm work is available at a constant hourly wage rate represented by BC. Assume, further, that this rate is below the average productivity of labor in farming equal to CD. The farmer will continue to work solely on the farm as long as the on-farm marginal wage rate exceeds the off-farm wage. When the off-farm wage rate rises above the on-farm rate, the farmer will be induced to transfer some of his work time to off-farm work. Thus the farmer moves to point J on U_2 by allocating DE hours to on-farm work, and EG hours to off-farm work with GO in leisure. The utility curves could have been drawn so that total work effort would have

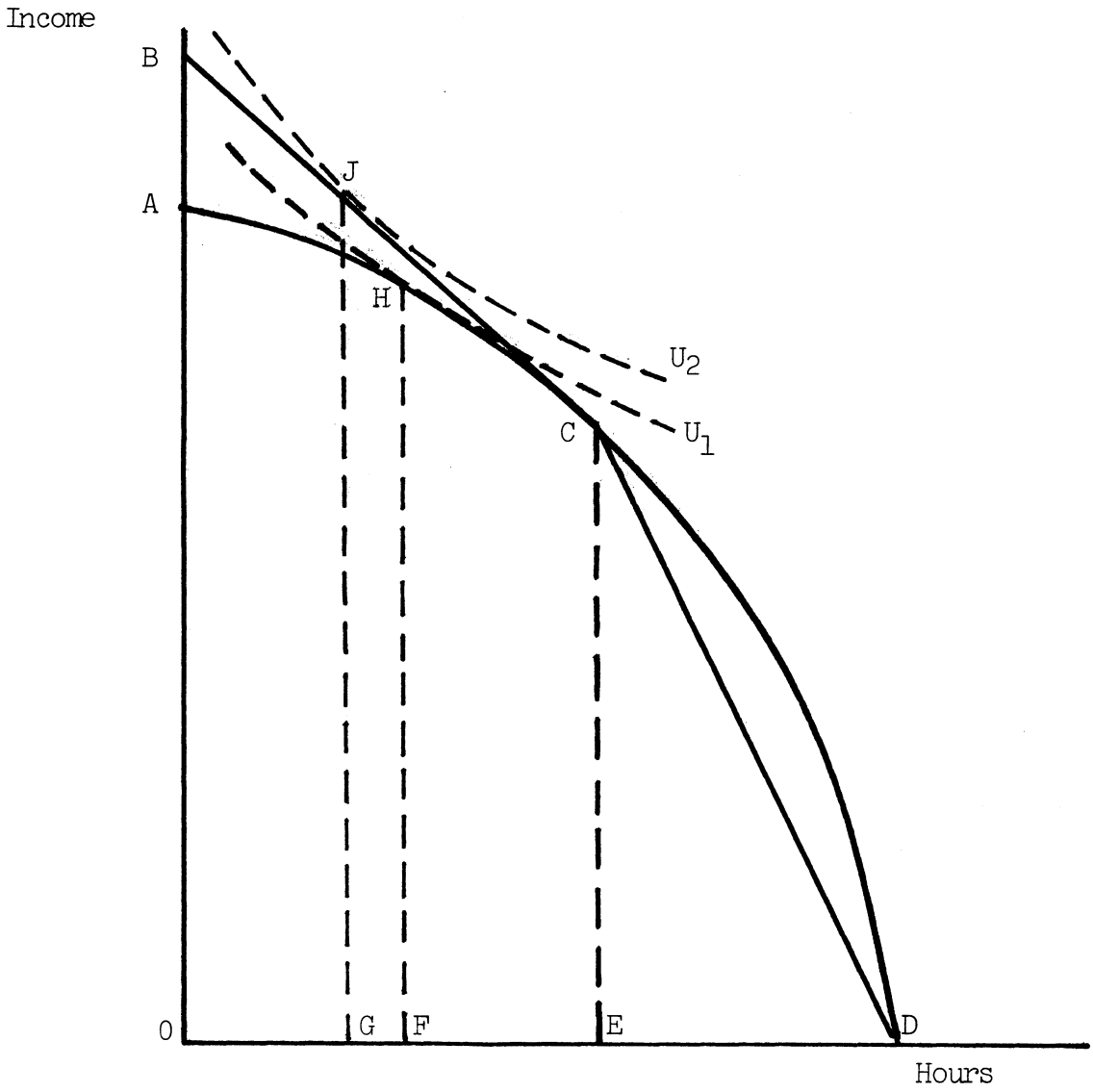

Figure 1: Multiple Job-Holding With Primary Job in Farming

declined rather than rise as shown in the figure. That would have led to the familiar backward bending labor supply curve.

It is possible that the farmer prefers on-farm work and prefers not to work off the farm. In this case he may establish an asking wage above the current off-farm wage (Barros, 1976). Thus, he would perform no off-farm work even though the off-farm rate is higher than the marginal on-farm rate.

Now consider the effect of changes in wage rates. First, assume an increase in the on-farm wage rate, which might be due to an increase in product prices or farm mechanization, while the off-farm wage rate is constant. This effect can be shown in Figure 2 by rotating the farm earnings function upward to DC′LA′. There is no substitution effect since there is no change in the opportunity cost of home time. There will be an income effect as long as home time is a normal good. Demand for home time will increase, total hours worked will fall and on-farm work will increase relative to off-farm work.

Next consider the effect of an increase in the off-farm wage rate as shown in Figure 3 by the shift in wage line AC to BC′. The net effect on work time is indeterminant in this case. The higher the off-farm wage, the greater the opportunity cost for home time. This leads to a substitution away from home time and towards more work. On the other hand, the income effect of the wage increase raises the demand for home time.

Changes in the farm work period may also have an effect. A change in farm enterprises, for example, may change the amount of labor required for farm work. Assume in Figure 4, that the agricultural work period is reduced from DG to DF with no change initially in wage rates. The farmer who was

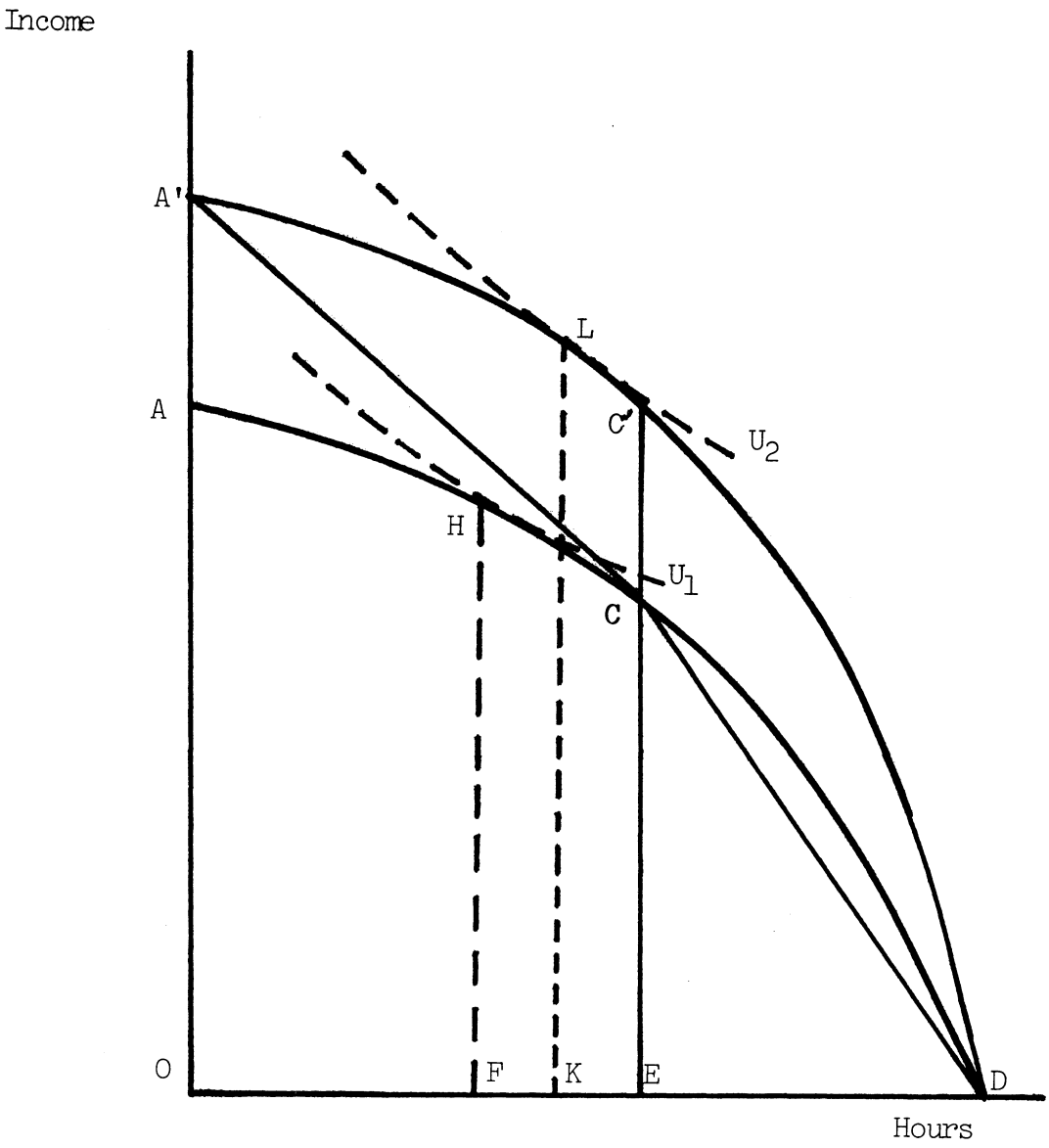

Figure 2: Effect of a Change in Farm Wage Rate on Time Allocation

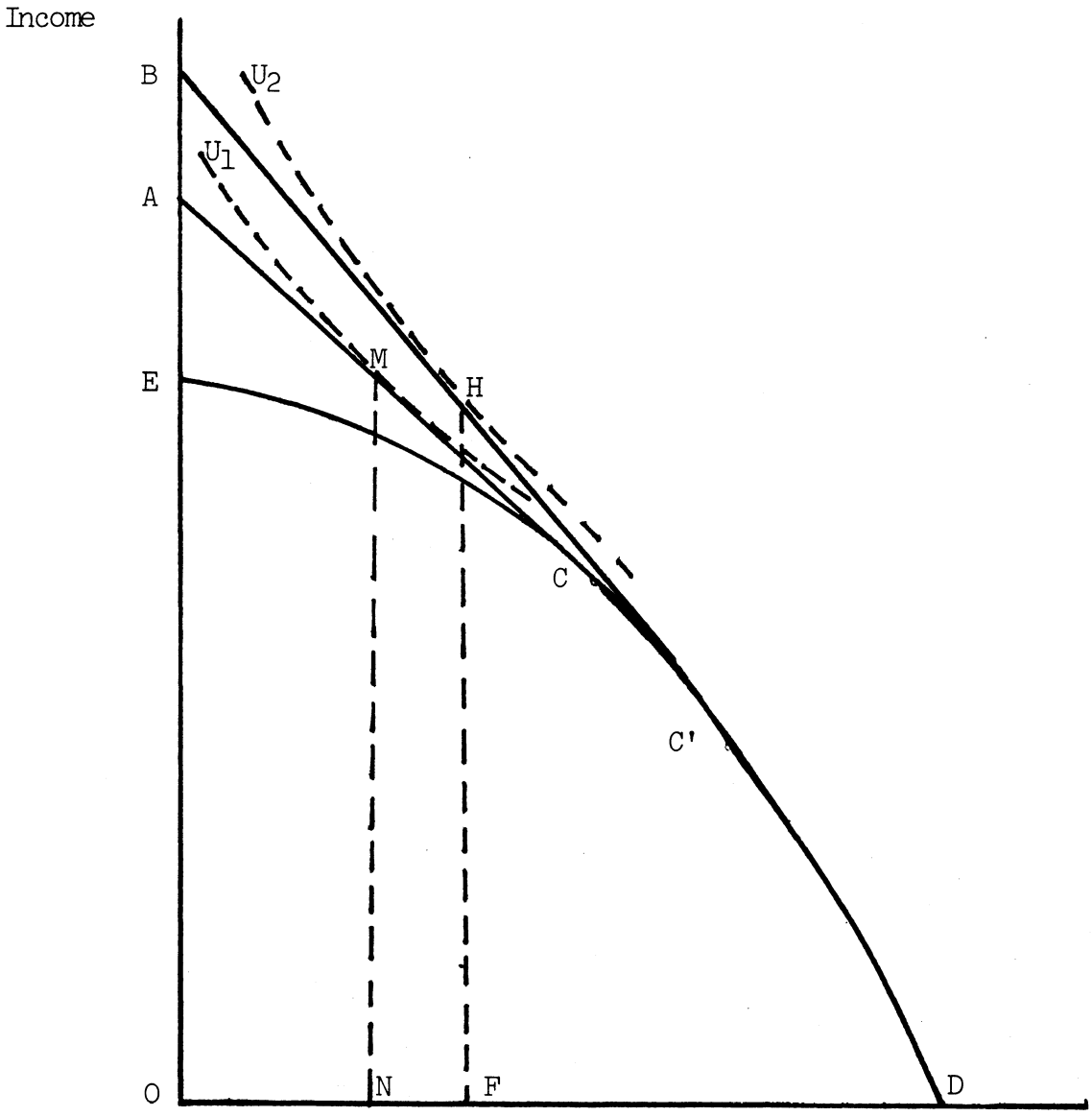

Figure 3: Effects of a Change in the Off-Farm Wage Rate on Time Allocation

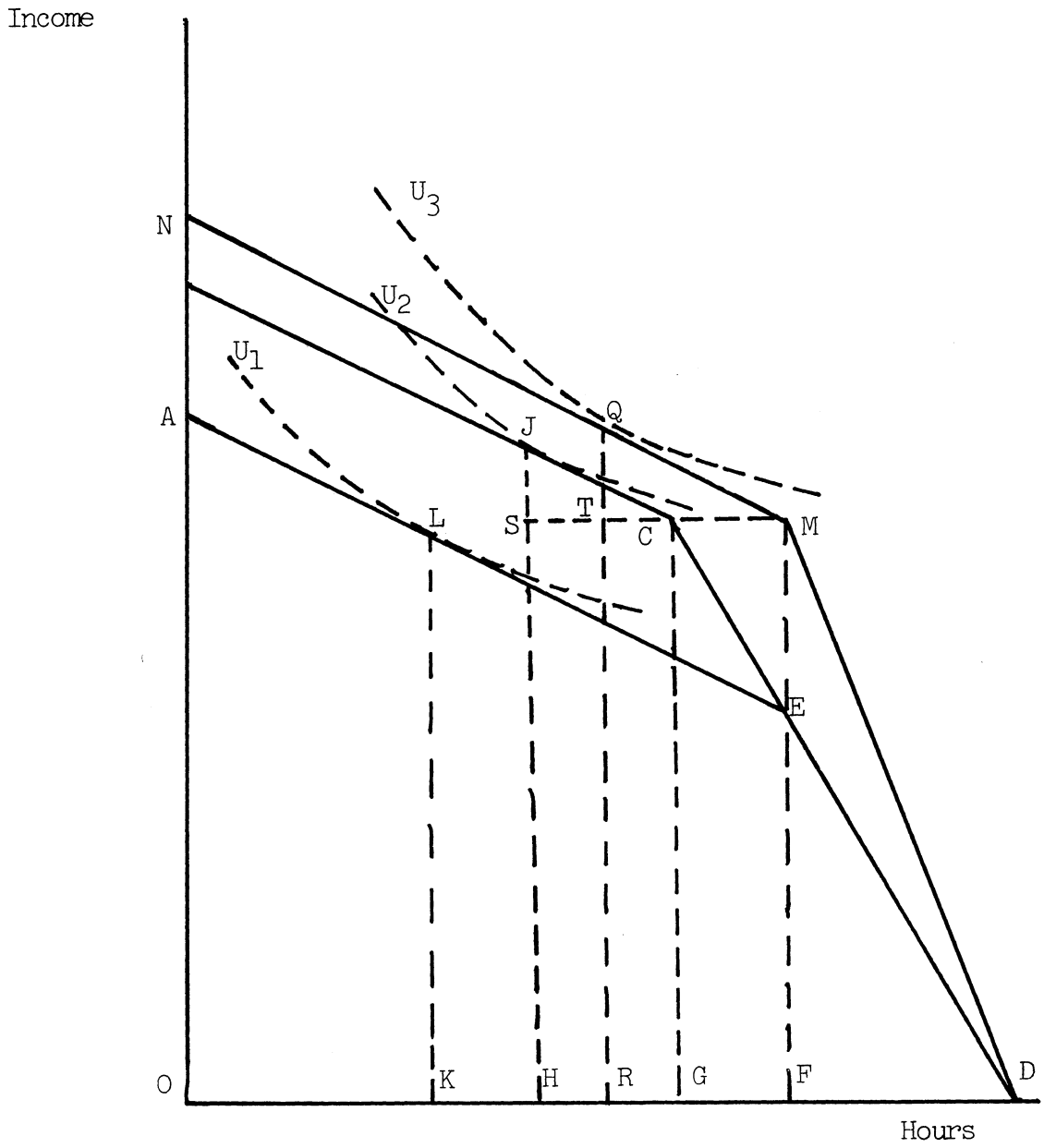

Figure 4: Effects of a Change in the Farm Work Period on Time Allocation

previously maximizing utility at point J and working GH off-farm, now decreases on-farm work to DF, increases off-farm work to FK but can only reach indifference curve U_1 at point L. However, if the on-farm wage rate would be simultaneously increased so that farm earnings would be maintained (i.e., GC = FM), then the farmer could reach U_3 at point Q and reduce total employment from DH to DR, while increasing off-farm work from GH to FR.

Another point of interest is the inclusion of nonearnings income as discussed by Bollman (1976), Huffman (1976) and Sexton (1975). In addition to the income earned from farm and off-farm work, farmers may earn nonearnings income such as dividends, rents, transfer payments, etc. Nonearnings income are shown as DA in Figure 5. In the absence of nonearnings income, the farmer can attain point J on indifference curve U_1, working DG on the farm, GK off-farm, spend KO in leisure and earn JK. With nonearnings income, the farmer can reach Q on indifference curve U_2, and reduce off-farm work from GK to GH under the assumption that leisure is a normal good.

Thus, it has been shown that for a farmer whose primary employment is on the farm, an increase in on-farm wage rate will lead to a decrease in off-farm work if the on-farm wage rate and farm period are held constant. An increase in the off-farm wage rate, holding farm work period and on-farm wage constant, will lead to either an increase or decrease in off-farm work. Reduction in the farm work period will increase off-farm work, while nonearnings income will decrease off-farm work.

Alternatively, it is possible that a farm operator considers off-farm employment rather than farm work as his primary occupation. It can be shown in this case that an increase in the on-farm wage rate will not affect

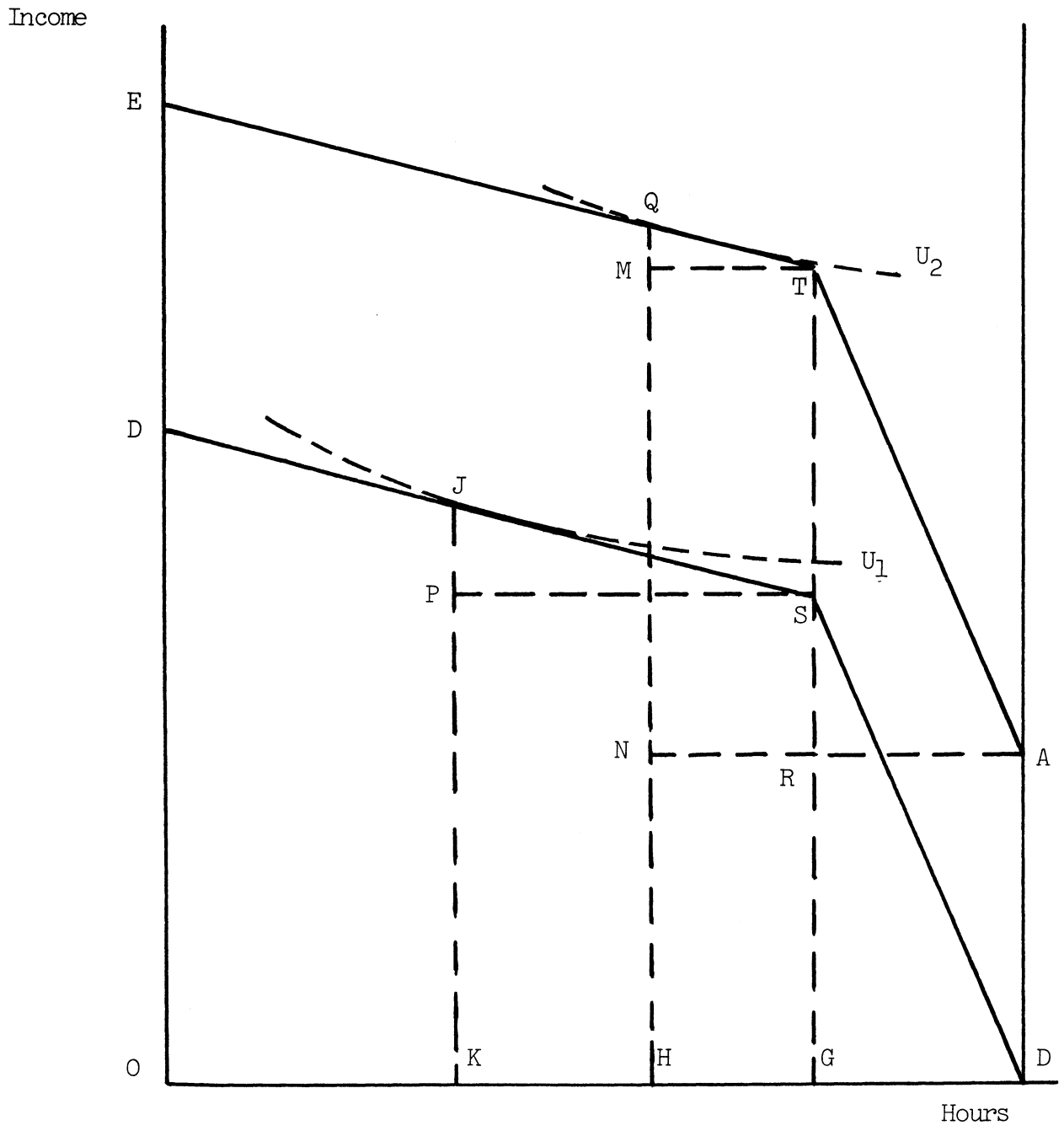

Figure 5: Effect of Nonearnings Income on Time Allocation

off-farm work if the off-farm work period and wage rate are held constant. If the on-farm wage rate rises above the off-farm rate, it is possible the farmer will change his primary job to farming and reduce off-farm work. An increase in the off-farm wage rate could produce various results. If the off-farm work period is fixed, the increase in off-farm earnings due to the off-farm wage increase could lead to a reduction in on-farm work. If the work period is not fixed, then off-farm work could also decrease with the wage rate increase. The relative strengths of the income and substitution effects would determine the actual outcome of the change in wage rate. Due to the potential difference in labor supply response between farm operators who are primarily farmers versus those whose primary occupation is off-farm work, it is useful to study these two groups of farmers separately.

Household Time Allocation

The preceding model of time allocation assumed that the farm operator was the decision-maker and the individual within the household providing farm and off-farm labor. The factors assumed to influence time allocation were on and off-farm wages, work period and nonearnings income. Recently the household has been increasingly recognized as the key decision making unit and other members of the household are recognized for their contribution to farm and off-farm work. This "New Household Economics" is emerging as a powerful theoretical construct to analyze intra-family allocation of time among market and nonmarket activities.

This theory views the household as a production unit using purchased goods and nonmarket time of the household members to produce the commodities

consumed by the household. As above, it is assumed that family resources are allocated to minimize the costs of producing these commidities, and therefore to maximize household utility. The difference is that this household approach recognizes that various members of the household will have different efficiencies in production. Those members with higher productivity in the labor market (i.e., earn higher wages) will specialize in labor force activities. Conversely those most efficient in converting purchased goods and home production time into family consumption goods will specialize in household production. Thus it is usually expected that women will spend relatively more time in the production of time-intensive commodities like raising children (Gronau, 1973; Gramm, 1975). It is also clear that certain farm tasks do not require much skill so wives, children and even hired unskilled labor will be used on the farm, while the farm operator uses his skills in off-farm work earning higher wages. Thus the farmer does not rely exclusively on himself to produce goods for family consumption. He can exchange his time with that of other household members.

Following Gronau, the intrafamily allocation of time can be determined. Consider a family of two members: husband and wife. The household combines its member's leisure time with market and home goods to produce utility (U) where (1) $U = U(X_i, Z_i, L_m, L_f)$. X_i denotes market goods, Z_i home goods, M the amount of the husband's leisure, and F the amount of the wife's leisure. Home goods are produced by combining market goods with time provided by husband or wife.

The family maximizes utility subject to its budget and time constraints. It is assumed that the family pools its pecuniary resources. Assuming a one-period model, the budget constraints specifies that total expenditures on market goods and inputs cannot exceed family income. When both the farm

operator and wife are multiple job holders, the budget constraint becomes:

(2) $P_mM + P_xX = W_{h1}H_{h1} + W_{h2}H_{h2} + W_{f1}H_{f1} + W_{f2}H_{f2} + V = I$

where P_m and P_x = price of market goods (M) and inputs (X)

W_{h1} = husband's on-farm wage rate

W_{h2} = husband's off-farm wage rate

H_{hi} = hours worked by husband on and off the farm

W_{f1} = wife's on-farm wage

W_{f2} = wife's off-farm wage

H_{fi} = hours worked by wife on and off the farm

V = nonearnings income

I = family income

Each household member faces a separate time constraint. Therefore

(3) $T_h = H_{h1} + H_{h2} + L_m + M$

(4) $T_f = H_{f1} + H_{f2} + L_f + F$

where T = total time available

M = husband's home production time

F = wife's home production time and other variables as defined previously.

The maximization of the utility function (1) subject to a home production function and the budget (2) and time (3 and 4) constraints yields the family member's optimum allocation of time and the family's optimum allocation of expenditure between market goods and inputs.

Gronau derived the equilibrium conditions and demand elasticities for time for the basic model. Sexton applied the same basic model to allocation of time in a farm household. The effect of a change in off-farm wage rate

on the husband's (wife's) off-farm work could not be determined unambiguously. Demand for nonmarket time will increase if the income effect is larger than the substitution effect. The husband's (wife's) off-farm work would thus decline. However, if the income effect is less than the substitution effect, the husband (wife) would substitute more off-farm work for nonmarket time. It was found that when leisure is assumed to be a normal good, an increase in on-farm wages (assumed to be the primary occupation) reduces off-farm work and increases nonmarket time.

The cross effects of a change in the husband's (wife's) wage rate on the wife's (husband's) demand for nonmarket time were separated into income and substitution effects. Again the results are ambiguous. The results for nonearnings income were clear. If leisure is considered a normal good, an increase in asset income will reduce work in secondary employment (generally assumed to be off-farm work in studies of farm households).

Environmental Variables

The explanation of time allocation discussed above focused largely on farm and off-farm wage rates, work period and nonearnings income. Several additional factors could be expected to explain the variation in time allocation among farm households. These factors are sometimes referred to as environmental variables and some of the crucial ones are discussed here.

Farm Characteristics

Farm size will influence the amount of labor required for farm work. The larger the farm, the greater are the possibilities for the household to achieve a desired level of family income through farm work. Farm land is an

excellent asset to hold in many inflating economies so households are not likely to reduce farm size in order to increase the time available for off-farm work. Multiple cropping also affects the demand for farm labor. The greater the intensity of land use, the more the demand for farm labor. Although the intensity of land use could be considered endogenously determined by the labor supply model, there are often pressures exerted on farmers in heavily populated countries to maintain cropping intensity.

The type of enterprise found on a farm will influence labor demand and the on-farm work period. Certain enterprises like vegetables, fruits, specialty crops and some livestock enterprises require more labor than traditional rice growing. Thus once a particular enterprise is chosen, a portion of farm labor demand is predetermined.

Substitutes are available for family labor. As mentioned earlier, unskilled hired labor may release family labor for higher paid off-farm work. If appropriate technology exists, machinery and animal power may efficiently substitute for family labor. Thus, the effect of the stock value and/or expenditures for machinery and work animals need to be tested.

Family Characteristics

Education can affect the labor supply in several ways (Michael, 1972). Education has an effect on wages. The higher the education, the greater will be the skills and qualifications of the individual and the greater the probability that he will attain higher remuneration. Education may also be a proxy for a person's ambition, as well as tastes and preferences toward market work.

Age and health of the individual can be expected to influence time allocation. Labor force participation varies over the individual's life cycle. With advanced age, the individual may choose to work less and many industrial firms resist hiring new middle-aged employees. Health problems are likely to be more frequent with advanced age.

Family size and composition influence time allocation. A large family relative to the size of the farm will be forced to seek off-farm work to reach high per capita income targets. On the other hand, a family with several small children or old people may require so much time of the adults, especially the wife, that little time is left for participation in the labor market. As children become older, they may perform some of the farm work and child care thereby releasing adults for off-farm work.

Socio-Psychological Factors

Some countries have strong traditions about the roles of family members, particularly women. In some countries, women are expected to perform traditional roles within the home and are frowned upon if they attempt certain farm tasks or off-farm work. On the other hand, women in many African countries traditionally do certain farm tasks so husbands have more time for off-farm work.

Attitudes vary towards work and the types of work considered acceptable or desirable. Some individuals have far less inclination to work off the farm and face the structured, demanding role that industrial work might entail. Racial and ethnic differences in work patterns may represent different attitudes toward work or economic discrimination.

CHAPTER IV

OFF-FARM EMPLOYMENT AND FARM INCOME IN TAIWAN[8/]

This chapter presents an analysis of off-farm employment and its impact on farm income in Taiwan. The first section presents brief highlights of the post World War II Taiwanese economy. Some of the economic development strategies used in Taiwan are discussed as they relate to off-farm employment of farm households. Trends in farm household income and income distribution are discussed. The last section presents the results of analysis to determine the factors associated with off-farm earnings.

THE POST WORLD WAR II TAIWANESE ECONOMY

Overview

The Taiwanese economy has experienced rapid growth since World War II. Real GNP rose at an annual rate of 8 percent during the years 1953 to 1975 (Table 9) and per capita income reached U.S. $700 in 1975. The industrial sector grew at a rapid 14 percent per year compared to the rather substantial growth registered in agriculture of over 4 percent. During the first four governmental Four-Year Plans beginning in 1953, emphasis was placed on industrialization under the slogan "Agriculture supports industry, and industry develops agriculture." Beginning with the fifth Four-Year Plan in 1969, greater attention was given to the rural sector.

8/ Parts of this chapter draw heavily from the unpublished M.S. thesis of Mei-Yu Wu and an unpublished paper by Marcia Gowen on "Taiwan's Economic Development and Market Linkages."

TABLE 9: Annual Growth Rate of Selected Indicators of Taiwan's Economy, 1953-1975

Period	GNP	Population	Production		Export	Import
			Agr.	Ind.		
1953-1956 (1st Plan)	7.5	3.7	5.0	11.8	23.3	19.1
1957-1960 (2nd Plan)	6.3	3.6	4.2	11.9	20.7	23.7
1961-1964 (3rd Plan)	8.5	3.2	5.9	13.4	31.4	12.8
1965-1968 (4th Plan)	9.4	2.7	5.7	17.8	16.4	20.8
1969-1972 (5th Plan)	10.8	2.9	2.2	21.3	39.6	29.3
1973-1975 (6th Plan)	5.1	1.8	1.3	7.8	20.8	37.7
1953-1975	7.9	3.0	4.1	14.0	25.7	23.9

Source: Taiwan Statistical Data Book, 1976, Economic Planning Council, Executive Yuan, Taipei, Taiwan.

Export promotion has been a key factor in the development strategy. The rate of growth in exports exceeded 25 percent per year between 1953 and 1975. The value of industrial exports grew from less than U.S. $10 million in the early fifties to over U.S. $4 billion in 1975. In spite of this rapid growth in total exports, the value of imports frequently has been even larger and capital transfers have helped cover balance of payments deficits.

Taiwan's experience in population policy has also been unqiue. In the 1950's population growth exceeded three percent per year, but due to reduced immigration and birth control programs, the rate fell below 2 percent in the 1970's. The agricultural population reached its peak of just over 6 million persons in 1969 and began to decline thereafter.

Substantial structural changes have occurred in the Taiwanese economy. Industry now accounts for about 35 percent of net domestic product, while the agricultural share has fallen to less than 20 percent. Industrial exports represented less than 10 percent of the total in 1953, now represent over 80 percent. Industrial employment, however, represents only 24 percent of the total, while agriculture still employs about 37 percent. Clearly, agriculture lags behind industry in productivity in spite of being very productive when compared to other countries.

Economic Development Strategies

The Taiwanese have followed a number of industrial and agricultural strategies which appear to have influenced the trends in rural household incomes discussed in the next section. Some of the most important strategies are briefly summarized here.

Promotion of Labor-Intensive Industry

Unlike several other low income countries, Taiwan has pursued an industrialization strategy designed to reduce the drain on scarce capital and utilize fairly abundant labor. Labor-intensive small and medium industries have benefited from special loans, technical assistance, input supply and market expansion programs, etc., provided by the government. Food processing, light machinery, textiles and clothing industries have benefited and together they represent one-third of the manufacturing sector (Vepa, 1971).

Geographic Distribution of Industry

Taiwan is small (240 miles in length, less than 90 miles wide at its maximum width) but the central mountain range presents a significant barrier so much of the industry is located in the west. To encourage decentralization, in 1972 the government began setting up industrial parks, provided loans to factories to purchase land, offered tax benefits for decentralization and improved rural infrastructure. Four parks have been set up to date and private investors have been encouraged to set up factories for food processing, handicrafts and other labor-intensive products. One hundred and eighteen factories had been set up by 1972 (Yu, 1972). The smallness of the country coupled with this industrialization strategy places off-farm employment opportunities in close proximity to rural households.

Foreign Trade[9/]

Taiwan's trade policy has experienced two phases: the import substitution phase (1950-59) and the export substitution phase (1959 to the present). During

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9/ Paauw and Fei (1973) discuss the Taiwanese foreign trade sector in detail.

the first phase, a multiple exchange rate system and tariff protection were employed to protect favored industries. Agricultural exports predominated. In 1959, policy shifted. A unitary exchange rate was adopted, tariff protection was progressively reduced, inflation was brought under control and interest rates were liberalized. Under this liberalized market system, growth emphasized the development of industries for the export of labor-intensive goods. The emerging industries employed the labor released from a modernizing agriculture. Entrepreneurial development was promoted by the transfer of technology from advanced countries through a variety of foreign assistance programs.

Land Reform

The postwar land reform, initiated in 1949 and completed in 1953, removed much of the inequality in the farm sector and set the stage for a unimodel rural development strategy (Johnston and Kilby, 1975). The program consisted of land rent reductions, public land sales and a "Land-to-the-Tiller Program." Landlords were required to sell land in excess of a small ceiling (three hectares in the case of medium-grade paddy) and new operators were assisted to buy the land. These changes contributed to the general trend in productivity increases experienced during the previous decades.

Subsequent controls on farm size have created problems however. The average amount of cultivated land per family declined consistently from 1.24 hectares in 1953 to 1.02 hectares in 1972. A slight upward trend has been noted since then. Land consolidation efforts are now in effect. Limits are placed on land fragmentation, credit is available for land purchase, and vocational training centers have been set up to facilitate the out-migration

of some farmers. Farmers that have reached the limit of biological technologies and cannot expand farm size must seek off-farm employment in order to raise family income.

Agricultural Technology

Taiwan's agricultural development traditionally emphasized improved infrastructure, agricultural research, dissemination of improved technology through farmer's associations, incentives to use new technology, and heavy taxation. Farmers have responded accordingly by increasing the use of new technology and intensifying land use. Yields have risen to high levels. In the latter part of the 1960's, however, the benefits of biological technology were largely exhausted and labor costs were rising. The government then shifted from a land-saving to a labor-saving farm mechanization strategy (Hu, 1975). Special policies were introduced including low interest rate machinery loans, farm machinery research programs, and technical training. Appendix Table 3 shows the number of all major types of agricultural machinery. Up to the early 1960's, the growth rate was fairly slow. In 1974 and 1975 expansion was more rapid due mainly to the promotion of joint farming, joint farm management and machine farming services (Shen, 1976). These efforts were undertaken to facilitate mechanization on small size farms. This expansion in mechanization can be expected to reduce peak season labor bottlenecks thereby facilitating increased agricultural production and more off-farm work.

Intersectoral Resource Flows

T. H. Lee (1971) has documented how the agricultural sector contributed to industry through taxes, land rents, food and raw materials, and transfers

through financial institutions. Before land reform, rents and interest payments were extracted from cultivators by landowners. Then the state in effect replaced the landlord through land reform and resources flowed out of agriculture in the form of taxes and land payments. A rice-fertilizer barter system was used to tax agriculture by setting an unfavorable implicit price ratio. Later financial institutions facilitated intersectoral financial flows. Although farmers may not have been squeezed more than other sectors, clearly the net effect has been to reduce disposable income. Thus, off-farm income sources offered an alternative means to increase family income.

FARM HOUSEHOLD INCOME TRENDS

Farm household income trends, as reported by farm record-keeping families, are shown in Table 10. Average farm and off-farm income is also shown in Figure 6. Average net farm income was just over NT $60,000 in 1960. From 1961 through 1965, farm income never exceeded NT $67,000. In 1966, however, it exceeded NT $70,000 for the first time, and climbed sharply to almost NT $80,000 by 1968. Farm income suffered a sharp decline to approximately NT $60,000 in 1969, then started to rise but did not exceed NT $80,000 again until 1974.

Average off-farm income showed a strikingly different pattern. It totaled less than NT $10,000 on the average in 1960, and slowly rose to NT $20,000 by 1968. It rose quickly thereafter reaching almost NT $30,000 in 1971 and took another jump to almost NT $50,000 by 1972. There was little change until 1975 when it took yet another upturn to almost NT $68,000. Thus it appears that the rate of increase in off-farm income moved sharply upward in 1969 just when farm income abruptly fell. Later as farm income recovered, off-farm income

TABLE 10: Average Family Budgets of Record-Keeping Families,[a/] Taiwan, 1960-75

Year (1)	No. of Families (2)	Average Net Household Income (3)	Average Net Farm Income (4)	Average Net Off-Farm Income[b/] (5)	Average Household Expenses (6)	Net Farm Income Minus Expenses (4)-(6)	Family Income Minus Expenses (3)-(6)	Off-Farm Income as % of Family Income (5)/(3)
1960	95	70,475	61,166	9,308	56,973	4,193	13,502	13
1961	207	75,900	65,596	10,304	62,154	3,442	13,746	14
1962	223	74,731	63,241	11,490	59,715	3,526	15,016	15
1963	277	77,327	66,648	10,679	59,415	7,233	17,912	14
1964	535	71,596	58,605	12,991	54,893	3,712	16,703	18
1965	501	81,347	65,539	15,807	62,432	3,107	18,915	19
1966	430	90,215	73,687	16,527	65,224	8,463	24,991	18
1967	402	92,700	75,369	17,331	69,144	6,225	23,556	19
1968	416	99,744	79,859	19,884	71,438	8,421	28,306	20
1969	411	84,119	59,768	24,350	73,158	-13,390	10,961	29
1970	404	90,603	65,481	25,120	62,643	-7,162	17,960	28
1971	387	103,700	74,514	29,186	83,134	-8,620	20,566	28
1972	452	126,011	76,345	49,665	97,218	-20,873	28,793	39
1973	460	127,701	74,946	52,754	92,915	-17,969	34,786	41
1974	461	132,176	82,848	49,328	91,166	-8,318	41,010	37
1975	468	158,505	90,763	67,742	113,402	-22,639	45,103	43

Source: Computed from Report of Farm Record-Keeping Families in Taiwan, Department of Agriculture and Forestry, Provincial Government, Taiwan, various years 1961-1976.

a/ In 1975 NT$ deflated using index of wholesale prices. NT $38 = U.S. $1 at official 1975 exchange rate.

b/ Includes income from property, wages, sideline businesses, and miscellaneous sources.

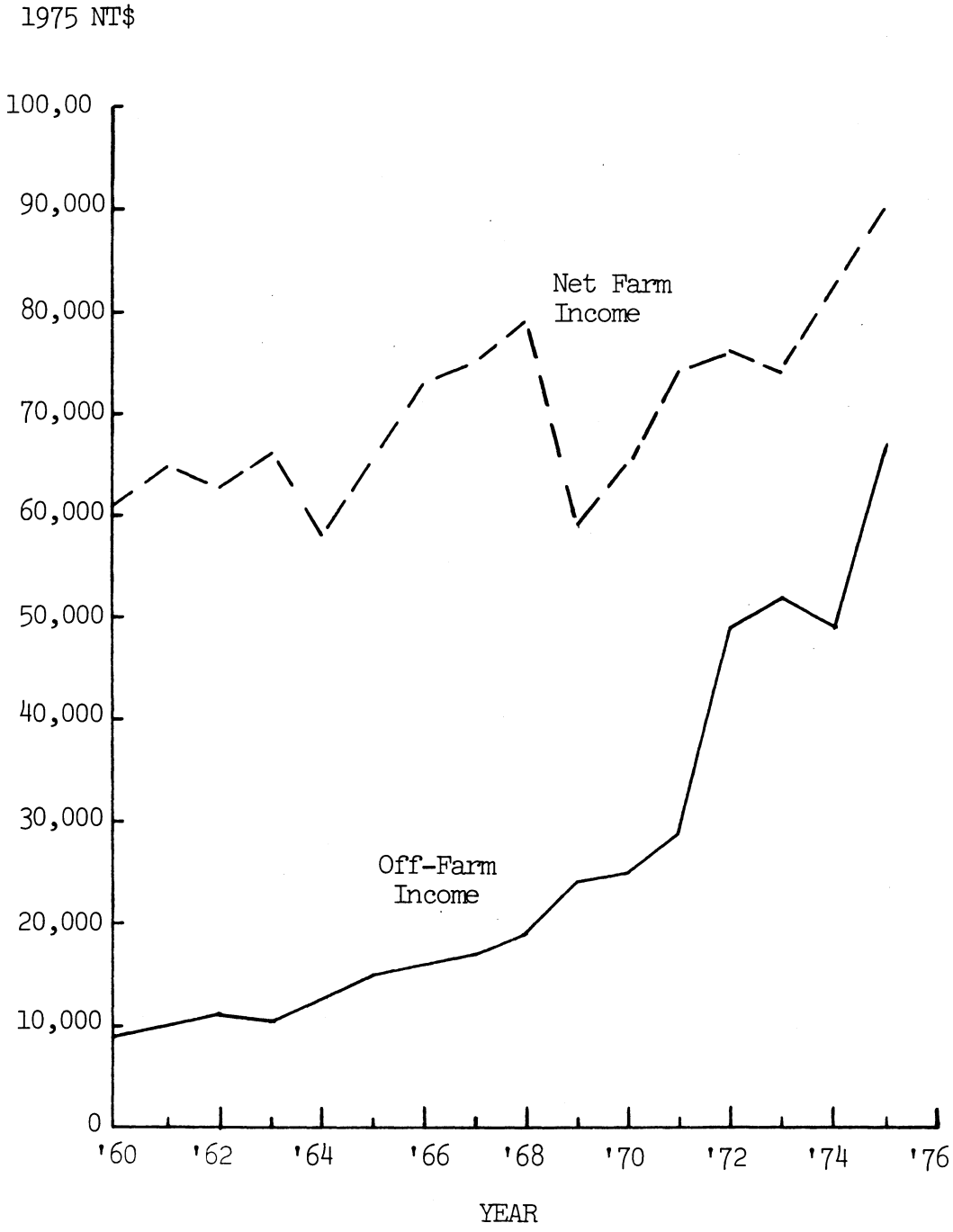

Figure 6: Farm and Off-Farm Income, Taiwan, 1960-1975

Source: Table 10.

continued its rapid upward trend rather than return to the slower pre-1969 rate of growth. As a result, the share of off-farm income in total household income rose from 13 percent in 1960 to 43 percent in 1975.

Off-farm income clearly helped Taiwanese farmers finance a fairly steady increase in household expenditures as shown in Table 10. Through 1968, farm income was sufficient to cover all household expenses. In spite of the decline in farm income in 1969, household expenses actuall increased because almost 20 percent were financed out of off-farm income. In all subsequent years, off-farm income represented a fairly significant source of income for household expenses.

The source of off-farm income has changed significantly over time as shown in Table 11. Income from property represented almost 20 percent of the total in 1960, but that share fell to less than half that amount in the 1970's. Wage income represented 20 to 30 percent from 1960 to 1971, then started to fall until it represented only about 9 percent in 1975. Likewise income from miscellaneous sources fell from about 30 percent in 1960 to less than 20 percent several times in the 1970's. On the other hand, the category of sideline income including various types of entrepreneurial activities rose fairly steadily from just over 20 percent to over 60 percent in the 1970's.

Small size farms tend to earn proportionately more income from off-farm sources. Table 12 shows the percentage of total household income coming from off-farm sources by farm size group from 1960-1975. In 1960, the smallest size group earned about 20 percent of household income from off-farm sources, while these sources represented only 8 percent for the largest size group. By the 1970's, however, approximately two-thirds of the household income of

TABLE 11: Off-Farm Income Sources of Farm Record-Keeping Families, Taiwan, 1960-1975

Year	Property Income	Wage Income	Sideline Income	Miscellaneous Income
1960	18.5	28.8	23.7	29.0
1961	18.9	24.9	26.5	29.7
1962	19.1	23.8	23.0	34.1
1963	14.6	26.4	35.0	24.0
1964	10.9	28.6	39.9	20.5
1965	10.3	26.1	38.4	25.2
1966	15.5	25.7	31.5	27.4
1967	12.6	26.1	35.9	25.3
1968	13.7	26.7	36.7	22.9
1969	9.8	27.5	41.5	22.2
1970	9.8	32.1	38.5	19.5
1971	10.1	23.8	42.9	23.2
1972	6.9	14.0	62.3	16.9
1973	8.8	13.1	62.6	15.4
1974	9.2	12.7	63.3	14.8
1975	8.8	9.1	60.7	21.3
1960-75 Average	12.3	23.1	41.4	23.2

Source: Computed from Report of Farm Record-Keeping Families in Taiwan, Department of Agriculture and Forestry, Provincial Government of Taiwan (PDAF), various years 1961-1976.

TABLE 12: Off-Farm Income of Farm Record-Keeping Families as a Percent of Household Income, by Farm Size, Taiwan, 1960-1975

Year	Farm Size Group in Chia[a/]				
	Less than 0.5	0.51 to 1.0	1.1 to 1.5	1.6 to 2.0	Over 2.0
	Percent				
1960	20.1	18.0	18.6	10.9	8.0
1961	19.9	19.2	13.9	6.0	14.4
1962	25.0	16.5	17.7	12.3	10.3
1963	33.3	18.3	14.6	11.4	8.2
1964	35.3	23.6	15.1	13.8	10.3
1965	35.3	24.8	17.9	15.2	11.8
1966	42.5	20.4	19.8	14.3	12.3
1967	41.5	19.7	17.6	18.8	12.1
1968	45.4	24.7	16.9	18.6	14.0
1969	54.5	37.7	26.0	24.6	19.0
1970	51.9	35.2	25.7	22.1	19.7
1971	53.3	32.8	23.8	28.5	22.2
1972	63.0	50.9	39.4	34.7	25.8
1973	67.6	47.3	42.5	38.6	25.5
1974	64.7	44.2	35.4	33.2	25.6
1975	69.9	51.1	44.0	38.5	26.0

Source: Report of Farm Record-Keeping Families in Taiwan, Department of Agriculture and Forestry, Provincial Government, Taiwan, various years.

a/ One Chia equals 0.97 Hectares.

the smallest size group came from off-farm sources as compared to one-fourth for the largest size group. The pattern was quite consistent for all size groups for all years. The larger the farm, the smaller the share of off-farm income in total household income.

Income distribution among farm households is improved because of this distribution of off-farm income.[10/] Gini ratios and income shares are reported in Table 13 for selected years. In 1960, the lowest 40 percent of the farm record-keeping families earned almost 22 percent of the farm income and almost 24 percent of the total household income. By 1974, this group's share of farm income had fallen to just over 15 percent, but the share of household income was still about 22 percent, due to the increase in off-farm income. The top 20 percent earned over 37 percent of the farm income in 1960 and that share had risen to over 45 percent in 1974. However, this group only increased its share of total household income from 36 percent to just over 38. Likewise, the Gini ratio for farm income shows a substantial increase from .29 in 1960 to .40 in 1974, but the ratio for household income only rose from .26 to .29. Clearly, if low-income farm households would not have earned such a large proportion of off-farm income, rural income distribution in Taiwan would have sharply deteriorated in this period.

10/ Taiwan is recognized as one of the few cases in the World Bank international comparison that seems to have experienced growth and rapid improvement in income distribution (Chenery, et al., 1974). The Gini coefficient of household income is reported to have improved from .56 in 1953 to .33 in 1964. In 1964, the lowest percent of the population in income received just over 20 percent of the income.

TABLE 13: Income Shares and Gini Ratios for Farm Households, Taiwan, Selected Years

Income Group	Year 1960		1965		1970		1973		1974	
	Farm	Family	Farm	Family	Farm	Family	Farm	Family	Farm	Family
Lowest 40 Percent	21.8	23.7	18.5	21.3	19.3	21.6	15.3	23.0	15.3	21.7
Middle 40 Percent	40.7	40.4	39.8	39.6	39.9	40.2	40.5	40.0	39.5	39.9
Top 20 Percent	37.5	35.9	41.7	39.0	40.8	38.0	44.3	37.3	45.3	38.4
Gini Ratio	.289	.258	.345	.301	.332	.289	.390	.275	.398	.294

Source: Calculated from Taiwanese farm record-keeping data.

An important question is, "How would income distribution have changed if there would have been fewer off-farm employment opportunities? This question cannot be answered unequivocally. Low-income households probably would have intensified farm operations so farm incomes would have increased. Given the high intensity of land use already in Taiwan, however, it is hard to imagine that further intensification would have produced the large amount of income earned from off-farm sources. Thus, household income distribution probably would not have become as concentrated as farm income reported here, but neither is it likely to have been as evenly distributed as was the case when large amounts of off-farm income were earned by low-income families.

OFF-FARM INCOME MODEL

The data presented up to this point have shown how off-farm income has grown for Taiwanese farm households and how it has contributed to improved income distribution. This section presents the results of analysis to test the factors associated with off-farm earnings.[11/]

MODEL SPECIFICATION AND DESCRIPTION OF DATA

Economic Model

The model used in this analysis is based on the theory presented in Chapter III. In a family context, the variables expected to explain off-farm earnings[12/] include: on-farm wage rate of each worker (husband or wife), off-farm wage rate of each worker, family nonearnings income, prices of market inputs, number of adults, number of dependents and several environmental factors. Since prices of market inputs are assumed constant in this type of cross-section study, the off-

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11/ These results are discussed in more detail in Mei-Yu Wu's thesis.

12/ Note the definition of earnings presented later in this chapter.

farm earnings function can be written as:

$$E = f(W_{i1}, W_{i2}, V, A, B, R)$$

where W_{i1} = on-farm wage rate of ith person in household,

W_{i2} = off-farm wage rate of ith person in household,

V = household nonearnings income,

A = number of adults in household,

B = number of dependents in household, and

R = environmental factors.

As noted in the theory section, the response of off-farm labor to changes in these variables may be different in those households where farm work is considered the primary work compared to households where it is treated as secondary employment. Therefore, in addition to adjusting the model to data from an entire sample of farms, the several data sets employed in this study were disaggregated into two groups of households: full-time and part-time farm households. Full-time farm families were defined as those earning more from farming than from off-farm earnings. In households where this occurs, it is likely that the farm is considered to be the primary job. Part-time farm families were defined as those earning more than fifty percent of total household income from off-farm earnings.

Description of Data

The data used in this analysis were compiled from a farm record-keeping project in Taiwan. The project originally started in ten vocational schools in 1953, later was transferred to farmer's associations, and finally in 1972 became the responsibility of local governments. The original data were recorded by farmers with close supervision, so a high degree of accuracy was realized.

Since the farms elected to participate in the project, it is possible that the sample is not completely representative of Taiwanese agriculture.

The summary data available at Ohio State University for the years 1960 to 1974 were compiled from the original records. As shown in Table 14, the number of farms varies from less than 100 to over 500. Some farms participated for several years.

The five years of 1960, 1965, 1968, 1970 and 1973 were selected for analysis. 1960 was chosen since it is the first year of available data, even though the number of observations is small and they represent only three of the eight agricultural regions. 1965 is the second year when all eight regions were included in the project. It represents part of the period when off-farm income was steadily rising, as shown earlier in Figure 6. 1968 represents the last year in the 1960's when farm income enjoyed a steady increase. In 1970, farm income was in the midst of a slump, while off-farm income was rapidly increasing. 1973 represented a year of peak off-farm income in the 1960-1974 period.

Definition of Variables

The summary nature of the data did not permit specification of the type of model ideally determined by theory. This section describes how the available data were treated in order to develop the most appropriate statistical model.

Off-Farm Earnings

Data were not reported on time worked off the farm. Thus, the dependent variable had to be specified as earnings rather than some measure of time. Household income is derived from several farm and off-farm sources. The off-farm sources include: a) property income from land, houses, financial instruments, machinery and livestock rental; b) wage income, c) sideline income including both salaries and income from various occupations; and d) miscellaneous income.

TABLE 14: Number of Farmers' Associations, Agricultural Regions, and Households in Record-Keeping Project in Taiwan, 1960-74

Year	Farmers' Associations	Agricultural Regions	Participating Farm Households
1960	7	3	95
1961	17	3	207
1962	18	3	223
1963	21	3	277
1964	40	8	535
1965	40	8	501
1966	28	8	430
1967	28	8	402
1968	36	8	416
1969	36	8	411
1970	36	8	404
1971	36	8	347
1972	36	8	452
1973	36	8	460
1974	36	8	461

Source: Department of Agriculture and Forestry, Provincial Government (PDAF), Report of Farm Record-Keeping Families in Taiwan, various issues 1961-1975.

Off-farm earnings were defined to include items b and c on the assumption they would most closely represent labor earnings. Since these data were reported as total amounts for the year, there was no way to test for the seasonality in labor use.

On-Farm and Off-Farm Wage Rates

Obtaining accurate measures of wage rates presented several problems. Data were not available to distinguish between the marginal returns to farm labor for the various members of the household. Time spent in off-farm work was not reported, nor were earnings reported for each household member.

A proxy was calculated for the on-farm wage rate by subtracting from net farm income an imputed 7 percent return to farm capital. This rate was assumed to represent a reasonable opportunity cost of capital since official interest rates were approximately this level for several years. The average daily on-farm wage rate was then estimated by dividing the resulting returns to family labor and management by the total number of household days reported spent on farm work.

Estimating the off-farm wage rate was more problematic. An estimate of off-farm labor days was required. It was assumed that 300 days for male adults and 150 days for female adults ~~was a~~ were reasonable approximations of the number of days worked by rural residents. Thus, the total family labor supply was estimated based on household composition. The days reported worked on the farm were deducted from the total labor supply, leaving a balanced assumed to represent off-farm work. Reported off-farm earnings were divided by off-farm work days to obtain the off-farm daily wage rate.

Some potential problems need to be recognized in this procedure in addition to obvious measurement errors. A positive bias may result when the dependent variable, off-farm earnings, is used as the numerator in the construction of the wage rate variable (Da Vanzo, et al.). No income was reported for the

farm households reporting no off-farm earnings. Thus, the wage rate is zero. A number of observations are clustered at this point. Higgins (1974) and Sexton (1975) used an instrumental variable technique to inpute a wage rate in these cases. The Taiwanese data, however, did not report the necessary human capital attributes of household members, such as age and education, required for this approach.

Nonearnings Income

Nonearnings income refers to the other sources of off-farm income not directly related to off-farm work. Included is income from household assets such as rents and interest, and other miscellaneous sources.

Family Size

Two measures of family size were included in the model. The first is the total number of adults between the years of 15 and 60 which represent the potential family labor supply. These adults are available for off-farm work and some adults can care for children while other family members undertake farm and off-farm work.

The number of persons under 15 and over 60 years of age were considered as family dependents. It was assumed that these persons would require a certain amount of care by the adults in the family. Thus, as the number of dependents increase, ceteris paribus, the adults must spend more time in dependent care and have less time to earn off-farm earnings.

Environmental Factors

A number of factors, in addition to on-farm and off-farm wage rates, such as nonearnings income and family size are expected to influence off-farm earnings due to their effect on the demand for on-farm labor. Several variables were

included to estimate this possibility. Farm size was included and was measured as the total number of hectares owned by the household. The cropping index was included as one measure of intensity of land use. It would be expected that an increase in cropping index would be associated with more farm work, thus, leaving less time for off-farm work. Finally, certain farming enterprises are more labor-intensive than others. For example, vegetable, fruit, livestock and poultry production are relatively labor-intensive compared to rice growing. To test the effect of enterprise on off-farm earnings, a variable was specified as the ratio of the receipts from these four enterprises to total farm receipts. Thus, a high ratio indicates a high proportion of labor-intensive enterprises.

Farmers have substitutes for family labor on farms and the use of these substitutes may release family labor for off-farm work. Thus, farm machinery, hired labor and animal labor were included in the model. All three variables were expressed as per hectare expenditures for the year.

Other household specific variables referred to in Chapter III could not be tested since the summary data did not report them. Thus, it was not possible to analyze factors such as age of husband and wife, their education levels, health status, etc.

EMPIRICAL RESULTS

Entire Sample

Farm Characteristics

Table 15 presents the mean values for selected characteristics of the sample farms for the five years studied. Farm and off-farm income patterns follow the trends noted above. Average real farm incomes were highest in 1968, and off-farm incomes were highest in 1973. The average farm wage

TABLE 15: Mean Values of Selected Characteristics of Sample Households,[a/] Taiwan, 1960, 1965, 1968, 1970 and 1973

Characteristics	Years 1960	1965	1968	1970	1973	F-Ratio[b/]
Sample Size	95	501	416	404	459	
Farm Income (NT$/year)[a]	45,893	48,924	56,663	48,669	56,333	6.99**
Off-Farm Earnings (NT$/year)	3,745	8,022	10,349	13,678	31,445	98.16**
On-Farm Wage Rate (NT$/day)	39.80	73.10	60.10	50.90	50.40	2.28
Off-Farm Wage Rate (NT$/day)	10.90	30.40	32.00	64.30	55.30	4.74**
Nonearnings Income (NT$/year)	3,380	4,429	6,146	5,681	10,162	15.59**
Adults (number)	4.41	3.96	4.39	4.30	4.66	6.13**
Dependents (number)	5.24	4.28	4.19	3.81	3.33	19.90**
Farm Size (ha.)	1.56	1.38	1.58	1.52	1.43	1.98
Cropping Index (percent)	229	212	206	186	188	19.98**
Farm Receipts Ratio (NT$/NT$)	N.A.[c]	0.32	0.36	0.38	0.42	16.56**
Household Farm Labor (days)	622	434	531	433	339	40.51**
Machinery Expense (NT$/ha.)	436	1,447	978	1,813	1,913	3.94**
Hired Labor Expense (NT$/ha.)	2,184	3,144	3,470	4,412	5,617	31.96**
Animal Labor Expense (NT$/ha.)	370	434	382	351	412	0.76

Source: Farm Record-Keeping data.

a/ Monetary values are shown in 1973 NT$, deflated using the index of wholesale prices.

b/ F-ratio is equal to: Between-groups mean square/within groups mean square. The degrees of freedom for all characteristics in table are 4 and 1870 for the numerator and denominator, respectively. * = significant at 0.05 level, ** = significant at 0.01 level.

c/ This variable was not available for 1960. F-ratio is for 1965-1973 data only.

rate was highest in 1965 exceeding NT $73.00 per day but declined thereafter. On the other hand, the daily off-farm wage rose steadily to NT $64.00 in 1970, then declined slightly to NT $55.00 in 1973. Average nonearnings income roughly tripled from 1960 to 1973.

The trend in wage rates relative to off-farm earnings is interesting. Ho suggested that during the period 1951 to 1965 labor transfer from the agricultural to nonagricultural sector in Taiwan occurred without the inducement of a large wage differential. Likewise the wage differentials for farm and off-farm work were in favor of agriculture during the 1960's on these farms so the expansion in off-farm earnings that occured in the period did not appear to occur as a result of wages. However, the situation changed in 1970 when the off-farm rate first exceeded the farm rate. The sharp upturn in the increase in off-farm earnings beginning in the latter 1960's and continuing into the 1970's is consistent with the wage rate differential turning in favor of off-farm work. This could mark the beginning of more competitive labor markets.

Several changes also occurred in the households and farms during this period. The average number of adults per household tended to increase, while the average number of dependents declined. Average farm size fluctuated between 1.4 and 1.6 hectares with no clear trend. These changes may have been due to the differences in households that participated in the project. The cropping index for 1970 and 1973 was substantially less than the previous years suggesting a decline in intensity of cropping but the farm receipts ratio increased indicating a larger share of farm receipts coming from more labor-intensive enterprises.

The number of days the household spent on farm work sharply declined from over 620 in 1960 to about 340 in 1973. Given the increase in average number of adults in the family, the decline in average days worked on the farm would suggest more work was being conducted off the farm. Some of this decline may be explained by family labor substitutes. Machinery and hired labor expense both increased. There was no pattern to the variation reported in animal labor expense.

Model Results

The results for the estimates of the off-farm earnings model are presented in Table 16 for the total sample for 1960, 1965, 1968, 1970 and 1973. The elasticity of off-farm earnings with respect to each variable calculated at the mean level of the observations is also presented. In all cases the regressions were significant at the one percent level and the adjusted coefficients of determination ($\bar{R}^2$) range from 0.105 to 0.527. The model explained a much larger proportion of the variation in off-farm earnings in 1973 than in the other years.

The on-farm wage rate had a negative influence on off-farm earnings in all years as expected, but the coefficient was significant only in the last two years. The elasticity of off-farm earnings with respect to this variable was very low suggesting that as the on-farm wage rate changes, there will be a less than proportionate change in off-farm earnings. This result implies that off-farm earnings are not significantly affected by farm income.

The off-farm wage rate had a positive effect on off-farm earnings, as expected, and the coefficient was significant in all five regressions.

TABLE 16a: Regression Coefficients and Related Statistics for Sample Households, Taiwan, 1960, 1965, 1968, 1970, and 1973

Independent Variables	1960 Regression Coefficient	1960 Elasticities of Off-Farm Earnings	1960 T-Value	1965 Regression Coefficient	1965 Elasticities of Off-Farm Earnings	1965 T-Value	1968 Regression Coefficient	1968 Elasticities of Off-Farm Earnings	1968 T-Value
1. Intercept	-1242.2	—	—	2918.6	—	—	-4069.6	—	—
2. W_1	-8.29	-0.09	1.06	-10.37	-0.09	1.09	-9.87	-0.06	1.27
3. W_2	104.6	0.31	4.50**	12.76	0.05	3.54**	8.38	0.03	8.63**
4. V	0.04	0.04	0.39	0.11	0.06	1.97	0.19	0.11	2.77
5. A	335.1	0.62	2.34**	946.0	0.66	4.92**	2045.1	1.14	7.05**
6. B	15.1	0.03	0.12	32.8	0.33	2.65	262.9	0.14	1.09
7. L	219.6	0.14	1.17	-1520.6	-0.37	4.03**	-1753.9	-0.35	2.64**
8. X	4.07	0.39	0.66	-14.41	-0.54	2.09**	-14.69	-0.38	1.30
9. F [a]	—	—	—	2531.3	0.14	1.38	7673.9	0.35	2.42
10. S	-0.21	-0.02	0.43	-0.02	-0.00	0.25	0.52	0.05	1.31
11. H	0.17	0.10	0.63	0.38	0.15	2.11*	0.65	0.22	2.47**
12. G	0.10	0.01	0.14	2.03	0.11	2.83**	1.24	0.05	1.11
$\bar{R}^2$		0.22397			0.10459			0.27918	
F-ratio		3.71**			6.31**			15.61**	
D.F.		(10,84)			(11,489)			(11,404)	

a/ Data not available for this year.

* Significant at 0.05 level.

** Significant at 0.01 level.

TABLE 16b: Regression Coefficients and Related Statistics for Sample Households, Taiwan, 1960, 1965, 1968, 1970, and 1973

Independent Variables	1970 Regression Coefficient	1970 Elasticities of Off-Farm Earnings	1970 T-Value	1973 Regression Coefficient	1973 Elasticities of Off-Farm Earnings	1973 T-Value
1. Intercept	5148.6	--	--	16586.8	--	--
2. W_1	-41.92	-0.16	3.51**	-10.96	-0.02	2.67**
3. W_2	9.64	0.05	3.56**	194.62	0.34	18.03**
4. V	0.18	0.07	2.82	0.15	0.05	2.15
5. A	2122.3	0.86	7.30**	5678.5	0.84	10.07**
6. B	604.5	0.22	2.26	-1320.9	-0.14	2.48**
7. L	-3059.9	-0.44	4.76**	-7312.7	-0.33	6.27
8. X	-12.53	-0.22	1.12	-42.69	-0.25	2.16*
9. F	-1247.6	-0.04	0.45	-1334.3	-0.18	3.77**
10. S	0.09	0.01	0.63	-0.26	-0.02	1.12
11. H	0.45	0.15	2.57**	0.67	0.12	2.98**
12. G	0.84	0.02	1.00	4.77	0.06	3.34**
$\bar{R}^2$		0.20660			0.52733	
F-ratio		10.54**			47.45**	
D.F.		(11,392)			(11,447)	

a/ Data not available for this year.

* Significant at 0.05 level.

** Significant at 0.01 level.

The coefficients were all inelastic ranging from 0.03 to 0.34 with the first and last years being relatively more elastic than the other three. The inelastic response suggests that as off-farm wage rates rise, off-farm earnings also rise but at a slower rate. This implies that the time spent working off the farm actually declines as the wage rate rises. This result could be explained in two different ways. First, if households are initially in equilibrium in the off-farm labor market, the reduction in off-farm work would imply a backward bending supply curve. The income effect of an increase in off-farm wage rate exceeds the substitution effect so households choose to spend more time in leisure. Second, the result could be explained by a lack of effective demand for the labor being offered which would imply that households work less than their desired amount of time in off-farm work.

As noted above, the daily on-farm wage rate declined from 1965 to 1973, while the off-farm wage rate increased. The combined effect was to increase off-farm earnings more than if only one of the variables would have changed. The shift in wage differential in favor of the off-farm wage, therefore, could logically explain part of the rapid increase noted in off-farm earnings.

The coefficient for nonearnings, V, was positive all five years rather than negative as expected. There are at least three possible explanations for this result. First, there may be some unspecified errors in measurement of nonearnings income. Second, some of the variation in off-farm and nonearnings income may simply reflect variations in household life cycle, time preferences, or tastes for assets rather than a causal relationship between income and labor supply. Third, Barros (1976) noted that nonearnings income may

tend to reduce the asking wage for off-farm work thereby increasing the probability of off-farm work.

The number of adults in the household, A, had a positive effect on off-farm earnings as expected and the coefficient was significant all years. The elasticity ranged from a low .62 in 1960 to 1.14 in 1968. Thus, a 10 percent change in number of adults is associated with approximately a 10 percent increase in off-farm earnings. In 1973, an additional adult was associated with an NT $5,700 increase in off-farm earnings compared to average off-farm earnings per adult of $6,750. This would imply that an additional adult earns somewhat less than the average off-farm earnings of persons currently working.

The variable for number of dependents, B, produced variable results. The coefficient was positive except for 1973, and was significant four out of the five years. The elasticity was variable but generally quite inelastic. One interpretation of this result is that an increase in number of dependents leads to both an income and substitution effect. An income effect occurs when an increase in dependents reduces per capita household income. Conversely, a substitution of home time for market time occurs when an additional dependent is added to the household. This implies that an adult must give up some off-farm earnings to take care of the dependent. The model results suggest the income effect prevailed up to 1973 when the substitution effect may have become more predominant. It is possible that per capita household income had reached a threshold level so that adults preferred to forego off-farm earnings when another dependent was added to the household.

Farm size, L, was insignificant in 1960 but significant and negatively related to off-farm earnings as expected the other four years. The elasticity

varied around .3 or .4 suggesting that a 10 percent change in farm size was associated with a 3 or 4 percent change in off-farm earnings. An increase in farm size would be expected to increase the demand for on-farm work so less off-farm work would be performed and less off-farm earnings realized.

The cropping index, X, had a negative influence on off-farm earnings four out of the five years but the coefficient was significant only in 1965 and 1975. There appeared to be a downward trend in the elasticity estimates. In 1973 the elasticity was .25. This result suggests that a change in the cropping index has a somewhat lesser impact on off-farm earnings than a change in farm size. A switch occurred in the relative importance of farm land and cropping index during the period. The elasticity of farm size was below that of the cropping index in 1965 and 1968, but above in 1970 and 1973 and coefficients were insignificant half the time.

The variables reflecting family labor substitutes gave mixed results. The machinery expense variable, S, was positive as expected two out of five years but the coefficient was always insignificant. Labor expenses, H, were always positively associated with off-farm earnings, however, and the coefficient was significant four of the five years. The elasticity was consistently around .1 or .2 suggesting that a 10 percent increase in expenses for hired labor was associated with a 1 or 2 percent increase in off-farm earnings. Finally, expenses for animal labor were also positively related to off-farm earnings and were significant in two of the five years.

The machinery expense variable was the most puzzling in light of the recent increase in farm mechanization. Perhaps this expense variable did not adequately capture the influence of mechanization and a stock variable, as used by Hu (1975) may have given better results.

The simple correlation coefficients for these models are presented in Appendix Tables 5 through 9. Generally the correlations among independent variables are reasonably low. The exceptions are the correlations between farm size and number of adults, and farm size and number of dependents. Larger farms are associated with more adults and dependents. Thus, these variables may be biased. Since several of the variables and the entire regression are significant, however, a serious problem of multicollinearity is not evident.

Full-Time and Part-Time Household Samples

The results presented above covered the five years analyzed with all observations included in the same model each year. The theoretical section discussed how part-time farmers might behave somewhat differently when off-farm work is considered the primary job. To test this possibility the samples were subdivided into full-time and part-time households with part-time households defined as those earning more off-farm earnings than farm income. In 1960, only two households met this criterion. In the other four years, however, a sufficient number of households met the criterion so the analysis was rerun separately for the two groups. The results of this analysis are reported in Appendix Tables 10 through 13. The results for 1973 are presented and discussed below.

Farm Characteristics

Table 17 presents the characteristics of the two types of households for 1973. These data plus Appendix Tables 11 and 12 reveal interesting differences in household characteristics and trends over time. Table 17 summarizes the trends in income and wages.

The number of observations meeting the part-time criterion varied between 29 and 47 in the first three years, then increased to 128 in 1973. Part-time farms were roughly half the size of full-time farms except in 1968. The number of adults on the full-time farms increased from about 4 in 1965 to 4.76 in 1973. Part-time farms had approximately the same number of adults although there was not as clear an upward trend. Both types of households reduced their number of dependents from over 4 in 1965 to just over 3 in 1973. The cropping index on the full-time farms (191) was significantly larger than on part-time farms (178) in 1973 (Table 17). Furthermore, the cropping index declined from 1965 to 1973 for both groups of farms but was always higher on the full-time farms. Full-time farms also had a consistent upward trend in the farm receipts ratio, while no clear trend was observed on part-time farms. Although the number of household labor days spent on the farm declined for both subgroups, the number of days spent on the farm was roughly double for full-time households.

Some interesting trends in income and wage rates are summarized in Table 18. Farm income on full-time farms was substantially more than double that of part-time farms in all years except 1968. Off-farm earnings were five times as much on part-time farms in 1965 and almost doubled by 1973, while such earnings more than tripled from NT $6,000 to over NT $10,000 between 1965 and 1973 for full-time households.

TABLE 17: Mean Values of Selected Characteristics, Full-time and Part-time Farm Households, Taiwan, 1973.

Characteristics	Type of Household		F-Ratio[a/]
	Full-time	Part-time	
Sample Size	331	128	6.99**
Farm Income (NT$/year)	69,077	23,376	1.98
Off-farm Earnings (NT$/year)	19,443	62,481	98.16**
On-farm Wage Rate (NT$/day)	86.30	-42.60	2.28
Off-farm Wage Rate (NT$/day)	33.50	111.70	4.74**
Nonearnings Income (NT$/year)	11,942	5,559	15.59**
Adults (number)	4.76	4.41	6.13**
Dependents (number)	3.42	3.09	19.90**
Farm Size (ha.)	1.66	0.84	1.98
Cropping Index (percent)	191	178	19.98**
Farm Receipts Ratio (NT$/NT$)[b/]	0.43	0.40	16.56**
Household Farm Labor (days)	397	192	40.51**
Machinery Expense (NT$/ha.)	1,862	2,045	3.94**
Hired Labor Expense (NT$/ha.)	5,320	7,372	31.96**
Animal Labor Expense (NT$/ha.)	311	673	0.76

[a/] F-ratio is equal to: Between groups mean square/within groups mean square. The degrees of freedom for all characteristics in table are 1 and 457 for the numerators and denominators respectively.

[b/] Farm receipt ratio is defined to be the ratio of receipts from vegetables, fruit, livestock and poultry to total farm receipts.

*Significant at 0.01 level.

**Significant at 0.05 level.

TABLE 18: Mean Values of Selected Characteristics, Full-Time and Part-Time Households, Taiwan, 1965, 1968, 1970, 1973

Item[a/]	Year			
	1965	1968	1970	1973
Farm Income				
Full-Time	51,423	61,319	52,782	69,077
Part-Time	16,640	37,562	17,425	23,376
Off-Farm Earnings				
Full-Time	6,016	7,477	10,593	19,443
Part-Time	33,934	48,674	37,114	62,481
On-Farm Wage Rate				
Full-Time	75.20	63.20	56.10	86.30
Part-Time	46.48	17.80	11.59	-42.63
Off-Farm Wage Rate				
Full-Time	27.10	25.70	63.60	33.55
Part-Time	73.60	115.90	70.00	111.70

Source: Appendix Tables 10 and 12.

a/ Monetary values are shown in 1973 NT$ deflated using the index of wholesale prices.

Wage rates present an interesting pattern. On-farm wage rates were substantially higher on full-time farms but tended to decline for both groups of households, except for an increase for full-time households in 1973. Part-time households had negative on-farm wage rates in 1973. Off-farm wage rates also varied widely among the four years with part-time households earning a rate usually three to four times greater than full-time households. Only in 1970 were the off-farm wage rates fairly close for the two groups.

Given these differences in calculated wage rates, the two subgroups of households appear to allocate more of their labor to those activities with the highest returns. Full-time farm households earn a relatively higher on-farm rate and spend more time in on-farm work. Part-time households earn higher wages in off-farm work and appear to spend more time in such work as evidenced by their higher off-farm income. The reasons for these wage differences are not clear. Part-time households may have higher levels of education and/or job skills which permit them to obtain higher paying work. Furthermore, they may invest more in their off-farm activity so the off-farm wage rate is actually picking up returns to capital and labor. Since capital investments in off-farm activities were not reported, there was no way to separate out the returns to labor vs. capital.

Full-time households earned twice as much nonearnings income as part-time households in 1973 and that difference had increased from 1965 when they earned about 1 1/2 times as much.

Model Results for Full-Time and Part-Time Households

Table 19 reports the regression results for the two subgroups of households in 1973, and Appendix Tables 11 and 13 present the same information for all four years. All regressions were statistically significant and the adjusted coefficients of determination ($\bar{R}^2$) ranged from .09 to .74. Generally the explanatory power of the model was greatest for part-time households except in 1973 when they were approximately the same.

The on-farm wage variable did not perform as well in these models as with the overall sample. The signs of the coefficients varied and none were statistically significant. The off-farm wage rate variable, however, had the expected positive sign in all cases and the coefficients were significant in all but one regression. There was no consistency in the elasticity estimates however. In the two years of 1965 and 1970, the elasticity on part-time farms was greater, but the situation reversed in 1973 when the response of off-farm earnings to off-farm wages was 0.63 on full-time farms compared to 0.24 on part-time farms. In both cases, the response was inelastic, but more elastic for full-time households.

Nonearnings income, U_1, continued to have the unexpected positive sign in both subgroups. Number of adults, A_1, was positively associated with off-farm earnings for both groups, and the elasticity was greater for full-time households in two of the three regression with significant coefficients. The variable for number of dependents, B, varied in signs and was frequently insignificant.

Farm size, L, was significant and had the expected sign for all full-time household models, but was insignificant and had inconsistent signs in the part-time models. Apparently, farm size has a consistent effect on off-farm earnings of full-time households, but not for part-time households.

TABLE 19: Regression Coefficients and Related Statistics "Full-time Farm Families" vs. "Part-time Farm Families," Taiwan, 1973

Independent Variables	Full-time Farm Families			Part-time Farm Families		
	Regression Coefficient	Elasticities of Off-farm Earnings	T-Value	Regression Coefficient	Elasticities of Off-farm Earnings	T-Value
1. Intercept	-1895.7	--	--	2981.5	--	--
2. W_1	0.42	0.00	0.16	13.88	0.01	1.14
3. W_2	362.9	0.63	18.69**	135.6	0.24	9.83**
4. V	0.13	0.08	3.10	1.88	0.17	5.30
5. A	4168.9	1.02	11.75**	7055.9	0.50	5.09**
6. B	-819.71	-0.14	2.40**	-702.4	-0.03	0.48
7. L	-2917.4	-0.25	3.93**	845.3	0.01	0.19
8. X	-15.29	-0.15	1.16	-4.39	-0.01	0.09
9. F	-4499.6	-0.10	1.64*	597.6	0.00	0.06
10. S	0.22	0.02	1.00	-0.44	-0.01	1.32
11. H	0.05	0.01	0.35	1.60	0.16	2.80**
12. G	-1.31	-0.02	1.16	3.11	0.03	1.27
$\bar{R}^2$		0.59742			0.57441	
F-ratio		45.52**			16.58**	
D. of F.		(11,319)			(11,116)	

*Significant at 0.05 level.

**Significant at 0.01 level.

This may be due to the fact that the farm serves primarily as a residence for part-time farms but an operating unit for full-time households. On the other hand, the cropping index, X, was inconsistent in sign and insignificant. The farm receipts ratio had the expected sign in the full-time models, but the coefficients were insignificant, and had mixed signs and were also insignificant in the part-time models.

The three variables for labor substitutes - expenses for machinery, hired labor, and animal labor - frequently had the correct sign but few coefficients were significant. Thus, no clear conclusions are evident.

Two methods were used to test the 1973 results to determine if the two subgroups of households were statistically different. A sum of squares residual test was used to compare the residuals of the entire sample relative to the two subgroups. The resulting F ratio suggested the subgroups were drawn from different economic structures. The dummy variable approach was used to test for equality of each pair of coefficients between the two groups. The variables with different coefficients were off-farm wage rate, nonearning income, number of adults, machinery expense, hired labor expense, and animal labor. Thus, it can be concluded that the two subgroups were significantly different.

CONCLUSIONS

Taiwanese farm households have increasingly turned to off-farm activities as a means to improve household income. A number of economic policies appear to have facilitated this process. The rate of increase in off-farm incomes of rural households sharply increased after 1968 when farm incomes took a sharp decline. By 1972, households on the average earned about 40 percent of their net income from off-farm sources. Small farms with low farm incomes tend to earn proportionately more income from off-farm sources. Thus, rural

household income distribution has only slightly increased from 1960 to 1975, even though there has been a substantial concentration in farm income over that period.

Off-farm earnings from sideline businesses and wages represent a major source of off-farm income. The daily off-farm wage rate for these earnings increased from 1960 to 1973, while the average on-farm wage rate tended to decline, so that in 1970 and 1973 average off-farm wages exceeded farm wages. The average number of days households reported spending on farm work steadily declined after 1968.

Several factors were found to be related to off-farm work. Generally, increases in off-farm wage rates, number of adults in the household, hired labor expense, and animal labor expense were associated with higher off-farm earnings. Increases in on-farm wage rates, size of farm and cropping index were associated with lower off-farm earnings. Contrary to expectations, non-earnings income may be positively associated with off-farm earnings.

The separate analysis for full-time and part-time households showed similar results, but in several cases the elasticity of off-farm earnings relative to several variables was greater on full-time households. Furthermore, the model explained more of the variation in off-farm earnings of full-time than part-time households. Part-time households earned higher off-farm wage rates than on-farm rates. On the other hand, on-farm wage rates of full-time farms were generally higher than their off-farm rates. Thus, it appears that the households were allocating larger amounts of labor to those activities that earned higher wage rates.

CHAPTER V

OFF-FARM EMPLOYMENT AND FARM INCOME IN KOREA[13/]

This chapter presents some of the same information on Korean off-farm employment and income as presented in the previous chapter on Taiwan. It will be shown that off-farm income, although important, does not present as large a share of farm household income as in Taiwan. Furthermore, both farm and off-farm income have been increasing so the off-farm share was roughly constant from 1962 to 1976. Consistent data for use in fitting an off-farm earnings model were available for only a few years in Korea. ~~so~~ These results are more abbreviated and less conclusive than the Taiwan results.

GROWTH OF THE KOREAN ECONOMY IN THE 1960's AND 1970's[14/]

Overview

In the early 1960's, Korea was basically an agricultural country in which agriculture provided two-thirds of the employment, almost half of the GNP and 20 percent of total exports. Beginning in 1962, the first of three Five-Year Development Plans was initiated. These Plans contributed to the subsequent transformation of the economy. The first Plan focused on building social overhead capital and developing basic energy industries. The second Plan concentrated on industrialization, expanding exports and promoting import substitutes. The third Plan focused on the agricultural sector, with emphasis on the Saemaul Undong or New Village Movement.

13/ This report deals exclusively with South Korea.

14/ Parts of this section were drawn from the unpublished M.S. theses of Kong-Nam Hyun (1977) and Young-Key Ro (1978).

The Korean economic growth rate of 9.9 percent per year during the fifteen year period of 1962-1976 surpassed even the Taiwanese experience (Table 20). The economy was led by an 18 percent growth rate in the secondary sector and a growth rate of exports in excess of 40 percent. The export sector has relied heavily on labor-intensive products such as textiles, clothing, plywood, and electronics. Per capita GNP rose from U.S. $83 in 1961 to U.S. $700 in 1976.

Like Taiwan, Korea has pushed birth control: the population growth rate averaged 3.0 percent at the beginning of the 1960's but was steadily brought down to 1.7 percent during the third Plan.

The developments of the past 15 years have produced several structural changes in the economy. By 1976, the proportion of total employment represented by agriculture had fallen to about 45 percent. Agriculture represented 23 percent of production and less than three percent of exports. The secondary and tertiary sectors represented 31 percent and 44 percent of GNP, respectively. Clearly the productivity of the agricultural sector still lagged behind nonagricultural sectors.

Economic Development Strategies

The Korean government has followed some economic development strategies similar to those of Taiwan, but others have been quite different. This section summarizes some of the important features of the strategies that appear to be related to off-farm employment opportunities of farm households.

Promotion of Labor-Intensive Industry

Korea has an unbalanced pattern of productive resources: a limited natural resource endowment and an abundant and relatively well trained stock

TABLE 20: Annual Growth Rate of Selected Indicators of Korea's Economy

1962-1976

Period	GNP	Population	Production by Sector			Exports	Imports
			Primary[b]	Secondary[c]	Tertiary[d]		
1962-1966 (1st Plan)	7.8	2.7	5.3	14.2	8.4	43.7	19.2
1967-1971 (2nd Plan)	10.5	2.2	2.5	20.3	12.2	35.2	26.2
1972-1976[a] (3rd plan)	11.2	1.7	5.3	20.1	8.5	47.2	30.4
1962-1976[a]	9.9	2.2	4.4	18.2	9.7	41.9	25.2

Source: Computed from Major Statistics of the Korean Economy, 1977 and the Korean Statistical Yearbook, various years, Economic Planning Board, Seoul, Republic of Korea.

[a] Computed with preliminary 1976 statistics.

[b] Includes agriculture, forestry and fisheries.

[c] Includes mining and manufacturing.

[d] Includes social overhead capital and other services.

of human resources. In the 1960's the labor force was characterized by almost total literacy, relatively high levels of education, industriousness, and relatively low wages (Cole and Lyman, 1971). Thus the Korean economy has concentrated on labor-intensive industries such as textiles, clothing, electronics and wood products. For the first two Five-Year Plans, emphasis was clearly on manufacturing and, within manufacturing, light rather than heavy industry, on labor-intensive rather than capital-intensive activities, and on "specialized" (export) rather than "integrated" (import substitute) products (Kuznets, 1977).

Geographic Distribution of Industry

Korea's rapid industrial growth of the 1960's and early 1970's was largely concentrated in and around Seoul and Pusan. Thus employment opportunities for off-season farm labor were limited and seasonal migration of farmers to the labor-congested urban areas was practically non-existent (Kim, 1970). In 1963, 30 percent of total manufacturing employment was located in Seoul, and 57 percent in the combined Seoul-Pusan-Kyonggi region. By 1973, these figures had grown to 33 and 63 percent, respectively (Kuznets, 1977). This concentration led to a policy shift for the third Five-Year Plan which argued for balanced growth by expanding regional development, and improving life in rural areas. The Saemaul Undong movement, announced in early 1972, included a program of eight-year investment loans, three-year operational loans, industrial estates, power facilities and tax benefits for firms locating in rural areas (Hasan, 1976). The expansion of firms into rural areas should improve future opportunities for off-farm work by rural households.

Foreign Trade

A shift in the structure of foreign trade has been one of the notable changes in the Korean economy. Korea largely pursued an import substitution strategy during much of the 1950's. The period was characterized by overvalued exchange rates, heavy trade deficits, low bank interest rates, little private savings, and heavy foreign aid. Capital goods were imported to promote heavy industry. The declining growth rates at the end of the 1950's prompted a policy change. Trade restrictions were reduced and financial markets restructured. Incentives were given to labor-intensive exporting industries which capitalized on the abundant supply of low cost labor. The result was that exports of miscellaneous manufactured articles rose from 7 percent of total exports in 1963 to over 40 percent by 1970.15/

Land Reform

Land reform in Korea occurred in two stages: distribution of land formerly owned by Japanese landlords in 1947 and land held by individuals owning more than 7.5 acres in 1949. The ceiling was set at 3 hectares so, except for recently developed upland areas, most farms are less than this size. Subsequent fragmentation has reinforced the small family farm system. In 1971, approximately two-thirds of the farm households had less than one hectare so households were required to seek outside activities to meet desired consumption levels (Sutt, 1971).

15/ Computed from data in the Korean Statistical Yearbook, 1975.

Agricultural Technology

The Korean government has pursued several programs to improve agricultural technology. Heavy emphasis has been placed on development of high yielding, fertilizer-responsive varieties, and expanding disease and insect control techniques. Efforts have been made to secure cheaper and more adequate supplies of fertilizer, chemicals and other production materials. Thus significant progress has been made in biological technology (Sutt, 1971; Hasan, 1976).

Beginning in 1962, greater attention was paid to increasing the supply of farm implements and machinery. Much of the machinery purchased has been financed by cooperatives, but in addition the government has provided subsidies and loans. The "all weather farming" scheme adopted in 1965 included irrigation, land reclamation and farm consolidation projects which facilitated mechanization. The stock of farm machinery grew at an extraordinary rate during the 1960's and 1970's. Power tiller numbers grew from 30 in 1961 to 60,000 in 1974, while the number of power threshers grew from less than 5,000 to over 100,000 in the same period (Appendix Table 14). This mechanization should have eased some of the seasonal labor bottlenecks in agriculture, facilitated the intensification of farming, and released labor for off-farm work.

Migration

Rural-urban migration has been substantial during this recent period of rapid growth. Approximately 3.5 million rural people, representing more than one-fifth the 1971 urban population, moved to urban areas during the 1961-71 period to take advantage of better employment and income opportunities. This number included a relatively high proportion of young men and women. Seoul

and Pusan absorbed nearly 60 percent of the total growth in population in the 1960's (Hasan, 1976). With improvements in rural income and employment creation through the Saemaul Undong movement, however, it is expected that the migration rate will slacken.

FARM HOUSEHOLD INCOME TRENDS

Farm household income trends, as reported by households included in the Farm Household Economy Survey, are shown in Table 21 and Figure 7. Average net household income, measured in 1970 prices, more than doubled from 117 thousand won in 1962 to 444 thousand in 1976. This growth rate in income was slightly faster than that of Taiwan for the same period. Bad weather and poor harvests contributed to the dip in farm income registered in the 1965-68 period.

Off-farm income grew at approximately the same rate during this period, so the share of off-farm income to total household income remained roughly constant at 20 percent. The off-farm income share varied from a minimum of 18 percent to a maximum of 24 percent with a tendency for the share to be somewhat higher during the 1965-1970 period. However, there was not a sharp increase in the off-farm income share as noted in Taiwan.

Off-farm income has been important in maintaining household expenditures in spite of the variation in farm income. Average household expenses exceeded average farm income in seven of the fifteen years reported in Table 21. But in all years there was a rather substantial margin of average household income over expenses, which has provided the source of funds for some of the expansion in deposits in farmer cooperatives (Lee, et al.).

TABLE 21: Average Family Budgets of Farm Household Economy Survey Families[a/]

Korea, 1962-1976

Years	Average Net Household Income	Average Net Farm Income	Average Net Off-Farm Income	Average Household Expenses	Net Farm Income Minus Expenses	Net Household Income Minus Expenses	Off-Farm Income % of House-hold Income
1962	176,784	140,693	36,091	145,154	-4,461	31,630	20
1963	201,251	165,318	35,933	171,065	-5,747	30,186	18
1964	205,561	168,429	37,132	165,928	2,501	39,633	18
1965	167,060	131,214	35,846	149,792	-18,578	17,268	21
1966	178,500	137,901	40,599	149,594	-11,693	28,906	23
1967	190,425	148,489	41,936	164,340	-15,851	26,085	22
1968	214,429	162,308	52,121	169,653	-7,345	44,776	24
1969	251,017	195,398	55,619	188,984	6,414	62,033	22
1970	259,261	197,292	61,969	211,304	-14,012	47,957	24
1971	332,493	272,878	59,615	228,583	44,295	103,910	18
1972	351,729	289,653	62,076	257,289	32,364	94,440	18
1973	369,370	300,387	68,983	262,158	38,229	107,212	19
1974	365,704	294,212	71,492	234,213	59,999	131,491	20
1975	364,681	297,375	67,306	262,941	34,434	101,740	18
1976	444,182	354,425	89,757	286,933	67,492	157,249	20

Source: Ministry of Agriculture and Fisheries (MAF), Republic of Korea, Report on the Results of Farm HOusehold Economy Survey, various years, Seoul, Korea. Reported in the unpublished M.S. theses of Kong-Nam Hyun and Young-Key Ro.

a/ All values deflated to 1970 prices using the Index of Wholesale Prices of Korea (Appendix Table). Average exchange rate for Korean won to U.S. dollar was 304 in 1970.

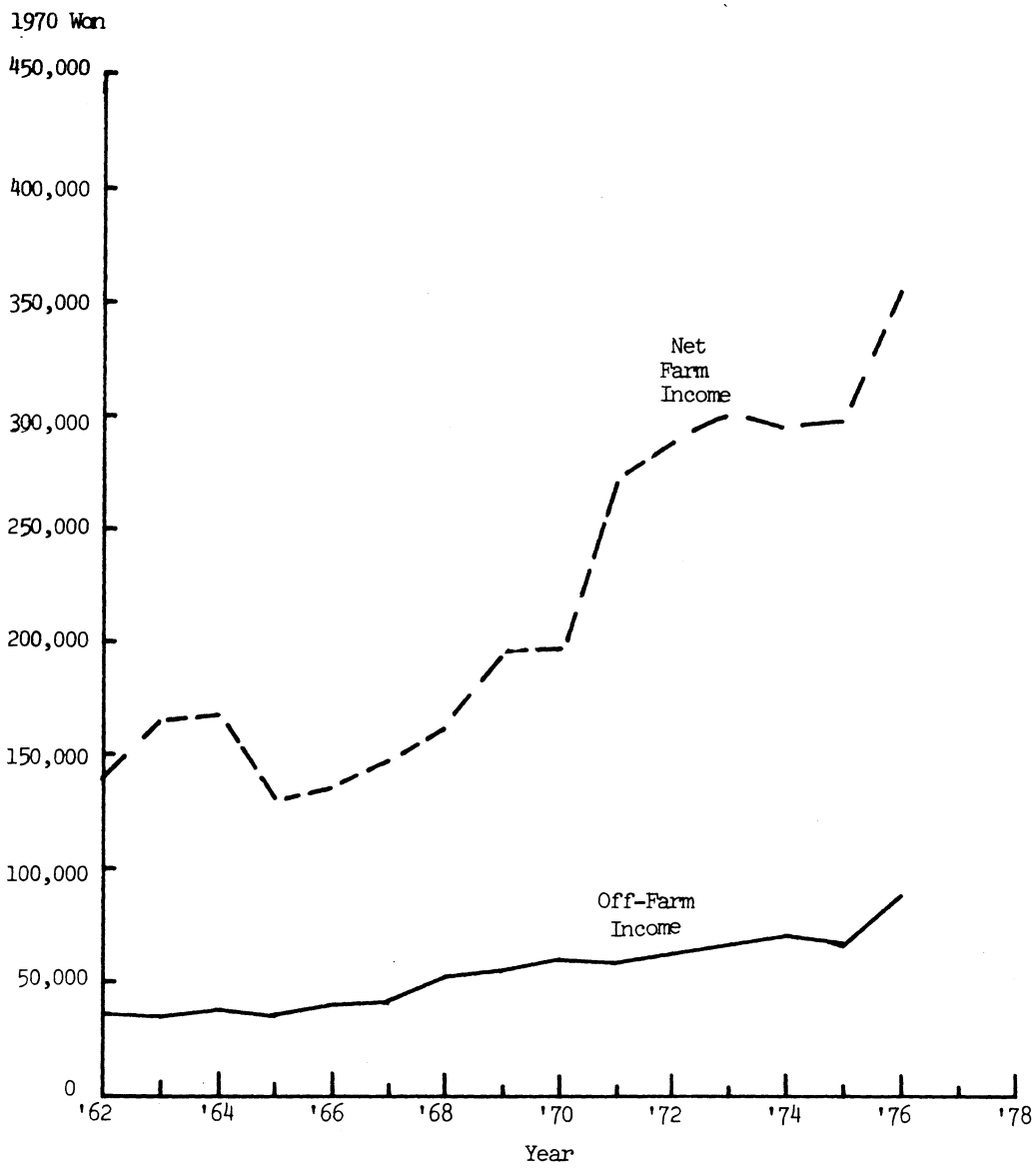

FIGURE 7: Farm and Off-Farm Income, Korea, 1962-1976

Source: Table 21.

The sources of off-farm income in Korea have not undergone the shifts noted in Taiwan. Labor income represented approximately 40 percent of off-farm income in the 1962-1976 period (Table 22). Donations, which presumably include family remittances, were second most important with almost 30 percent of the total. Sideline businesses showed neither the significance nor growth evident in Taiwan during recent years.

Small size farms consistently earned proportionately more income from off-farm sources in the 1962-76 period (Table 23). Farms with less than half a hectare earned about 40 percent of household income from off-farm sources. This proportion varied from 32 to 49 percent. As farm size increased, this proportion declined. Farms with over two hectares earned only about 10 percent of their income from off-farm sources. Thus they were much more dependent on farm income.

Unfortunately, the summary data for the Farm Household Economy Survey available at Ohio State University do not permit analyzing trends in farm household income distribution as reported for Taiwan in the previous chapter. Consistent information was available only for the 1968-1970 period. Income shares and Gini ratios are reported in Table 24 for two of the three years. The results are quite similar to those reported for Taiwan. Farm income was substantially more concentrated than household income both years although by international standards a Gini ratio of .35 would be considered low. Since households with low farm incomes earned proportionately more off-farm income, total household income was substantially less concentrated than farm income.

TABLE 22: Off-Farm Income Sources, Participants in Farm Household Economy Survey, Korea, 1962-1974

Year	Rental Income	Labor Income	Sideline Business	Donations	Others
			percent		
1962	2.3	46.2	18.7	29.4	3.4
1963	3.6	48.8	13.7	30.9	3.0
1964	5.1	43.2	20.4	26.2	5.1
1965	5.6	37.9	16.7	29.6	10.2
1966	5.9	38.8	18.5	28.2	8.5
1967	8.8	36.6	20.0	27.3	7.3
1968	5.6	37.6	20.0	27.6	9.1
1969	6.0	38.2	15.9	31.0	8.9
1970	5.3	39.9	15.6	31.4	7.8
1971	6.4	40.4	17.3	29.3	6.6
1972	7.0	40.5	19.1	27.6	5.8
1973	6.2	42.9	17.0	25.8	8.1
1974	5.0	42.7	16.8	27.5	8.0
1975	4.6	47.2	13.8	28.0	6.4
1976	3.5	43.5	12.1	23.0	17.9
1962-76 Average	5.4	41.7	17.1	28.2	7.8

Source: Computed from Reports on the Results of the Farm Household Economy Survey, Ministry of Agriculture and Fisheries (MAF), Republic of Korea, Seoul, Korea, Various Years.

TABLE 23: Off-Farm Income as a Percent of Household Income, by Farm Size Class, Participants in Farm Household Economy Survey, Korea, 1962-1976

Year	Farm Size in Cheongbo[a/]				
	Less Than 0.5	0.5 to 1.0	0.1 to 1.5	1.5 to 2.0	Over 2.0
1962	38	22	14	13	10
1963	32	19	15	12	9
1964	36	18	12	12	8
1965	41	22	16	15	10
1966	44	23	16	15	12
1967	46	24	16	14	12
1968	47	25	18	13	15
1969	48	25	15	17	14
1970	49	26	17	16	15
1971	44	20	11	12	9
1972	43	20	11	9	10
1973	46	22	12	10	8
1974	40	21	14	13	11
1975	42	21	13	9	8
1976	43	22	14	13	12
1962-76 Average	42.6	22.0	14.3	12.9	10.9

Source: Computed from Reports on the Results of the Farm Household Economy Survey, Ministry of Agriculture and Fisheries (MAF), Republic of Korea, Seoul, Korea, various years.

a/ One cheongbo equals 0.9917 hectares or 2.45 acres.

TABLE 24: Income Shares and Gini Ratios for Farm Household Participants in Farm Household Economy Survey, Korea, 1968, 1970 and 1971

Income Group	Year 1968 Farm	1968 Household	1970 Farm	1970 Household	1971 Household
Lowest 40 Percent	17.5	21.4	17.8	21.8	20.14
Middle 40 Percent	39.5	39.3	40.8	40.1	40.89
Top 20 Percent	43.0	39.2	41.3	38.1	38.98
Gini Ratio	.362	.301	.348	.290	.312

Source: 1968 and 1970 computed from data from Korean Farm Household Economy Survey. 1971 reported in Suh (1974).

Suh (1974) analyzed the 1971 Farm Household Survey data and 1977 data from the Urban Household Survey of the Economic Planning Board. The Farm Household data are reported in Table 24 and the results are fairly consistent with the other two years. A Gini ratio of .341 was obtained from the urban data, suggesting that urban incomes were somewhat more concentrated than rural household incomes. Comparative income levels were quite disparate. Rural households earned on average only 70 percent of urban household incomes, and since there were more persons in rural households, per capita income differences were even larger.

OFF-FARM INCOME MODEL

This section includes the results for the off-farm income model fitted to the Korean data. The summary data at Ohio State University provided consistent information for this type of model only for the years 1969 and 1970.

MODEL SPECIFICATION AND DESCRIPTION OF DATA

Economic Model

The model used in this analysis was similar to that used for the Taiwanese data, except for the addition of variables referring to household education and age. Some variables were specified slightly different, due to differences in the primary data collected. Prices of market inputs were assumed constant in this cross-section study, as in the previous Taiwan analysis, and households were divided into part-time and full-time farms on the same criterion.

For Korea, the off-farm earnings function can be written as:

$E = f(W_{i1}, W_{i2}, V, A, B, C, K, R)$

where W_{i1} = on-farm wage rate of i the person in household,

W_{i2} = off-farm wage rate of i th person in household,

V = household nonearnings income,

A = number of adults in household,

B = number of dependents in household,

C = education ratio of the household,

K = age ratio of the household, and

R = environmental factors.

Description of Data

The data used in this analysis were compiled from the Korean Rural Household Survey of the Ministry of Agriculture and Forestry (MAF). This survey was first initiated in 1953 with 300 households and expanded to about 1200 households in 1962. Annual summaries of the survey results, entitled Report on the Results of Farm Household Economy Survey, have been published since 1963.

A three-stage stratified proportional probability sampling procedure was used to select the households (Suh, 1974). The units of the Survey were farm households, based on the 1961 agricultural census, engaged primarily in farming and cultivating a plot of more than 1 tanbo (=.245 acre). To preserve the random selection, the enumerators keep the records for households that cannot fill in the questionnaire themselves. Each survey year covers January 1 to December 31, and data are collected monthly. The enumerators visit each household weekly to inspect the entries. From these original data, those observations with most consistent data were summarized and placed on tape. Of the total, data from 794 households were put on tape for 1968, 872 for 1969, and 1001 for 1970.

Definition of Variables

As with the Taiwanese data, the summary data did not permit specification of the type of model ideally determined by theory. This section explains the specification of the model derived for use with these data.

Off-Farm Earnings

The summary data reported off-farm earnings of the total household rather than the earnings per person that worked off the farm. Furthermore, the summary data did not report separately all the different categories of off-farm income noted in the previous section. Thus, all off-farm income has to be combined. Roughly 60 percent of this income was represented by labor income and sideline business (Table 22) which together closely parallel the off-farm earnings variable in the Taiwan data.

On-Farm and Off-Farm Wage Rates

On-farm wages were calculated the same as for Taiwan. A 7 percent return to farm capital was subtracted from net farm income. The resulting return to family labor and management was divided by the number of days the household reported working on the farm. This provided an estimate of the average daily wage rate for each day a household member worked on the farm.

The total number of days worked off the farm by the entire household was reported rather than the days of each individual. Therefore, the average daily off-farm wage was estimated by dividing total off-farm earnings by days worked. This resulted in an overestimation of actual wages since the earnings variable included income other than salaries and wages. As noted in the previous chapter, a positive bias may result from this procedure. Necessary human capital attributes of household members were not reported, however, so wage rates could not be estimated and imputed.

Family Size

The number of adults were reported in the data as the number of household members between 15 and 60 years of age. It was assumed these were the persons available for off-farm work and care of household dependents. The number of dependents were reported as the number of household members less than 15 and over 60 years of age.

Education and Age

Two types of information were reported which give insights into labor quality and potential off-farm wage rates. Education levels were reported as the number of household members who attended various types of school. It was assumed that the higher the level of education of work age persons, the higher would be the off-farm earnings. Thus, an education variable was constructed by dividing the number of household members with high school or college education by the number of household members between 20 and 55 years of age.

The information on age was reported as the number of persons in the household in various age categories. A variable to measure the age of household members most likely to be employed in off-farm work was constructed by dividing the number of adults between 20 and 55 years of age by the total number of household members ~~with~~ 15 or more years of age.

Environmental Factors

The same environmental factors used in the Taiwan analysis were used for Korea. Farm size was reported as number of hectares operated. The cropping index was reported as the total crop area divided by the number of hectares operated. The farm receipts ratio, used to measure the labor-intensity of the farm's enterprise mix, was formed by dividing receipts from pulses, potatoes, vegetables and other farm products by total farm receipts.

Farm labor substitutes were measured as machinery and hired labor expenses per hectare and animal labor days per hectare.

EMPIRICAL RESULTS

Data for the years 1969 and 1970 were the most consistent for the off-farm earnings model. The model was fit to the data for both years, but since the results were similar, only the results for 1969 are reported here.

Farm Characteristics

Table 25 presents the mean values for selected characteristics of the sample farms and the sample divided into the full-time and part-time subgroups. Only 161 farms met the part-time criterion of earning less than 50 percent of net household income from farm sources. Average farm income on full-time farms was three times that of part-time farms. The part-time farms earned 120,000 Won in off-farm income compared to 33,000 for full-time farm households. Surprisingly, the average off-farm wage rate was almost three times the on-farm rate for the entire sample. Full-time households earned an on-farm wage almost twice that of part-time households, but the off-farm rate for part-time households was almost four times that of full-time households.

The average number of adults in all households was about three. Part-time households, on the average, had almost one-half of a dependent less than full-time households. Likewise, part-time households had approximately three-quarters of a hectare of land compared to one and one-half hectares for full-time households. Taiwanese farms were approximately the same size in 1970, but had more adults and dependents. The cropping index was 150 for the sample, which is slightly less than in Taiwan, but the index for part-time

TABLE 25: Mean Values of Selected Characteristics of Sample Households, Korea, 1969

Item	Entire Sample	Type of Farm		T-Value[a/] (For Difference of Means)
		Full-Time	Part-Time	
Sample Size	872	711	161	--
Farm Income (won/year)	146,310	166,830	55,680	22.63**
Off-Farm Income (won/year)	49,380	33,380	120,040	22.90**
On-Farm Wage Rate (won/day)	2,163	2,360	1,290	2.68**
Off-Farm Wage Rate (won/day)	5,990	3,990	14,840	4.09**
Adults (number)	2.93	2.93	2.92	0.15
Dependents (number)	3.14	3.21	2.84	2.53*
Farm Size (ha.)	1.34	1.47	0.77	14.73**
Cropping Index	150	149	154	1.18
Farm Receipts Ratio (won/won)	0.26	0.21	0.49	1.69
Household Farm Labor (days)	132	146	72	8.6**
Machinery Expenses (won/ha.)	3,090	3,290	2,210	1.88
Hired Labor Wages (won/ha.)	9,590	9,280	10,950	1.07
Animal Labor (days/ha.)	6.98	7.29	5.63	3.95**
Education Ratio[b/]	0.08	0.07	0.11	1.88
Age Ratio[c]	0.66	0.67	0.61	2.24*

Source: Computed from Farm Household Economy Survey.

a/ Degrees of freedom = 870, ** = significant at .01 level, * = significant at .05 level.

b/ Number in household with high school or college education divided by number in household between 20 and 55 years of age.

c/ Number of household members age 20-25 divided by number in household 15 years or older.

households was greater than for full-time households, a result opposite to that found in Taiwan. Likewise, the farm receipts ratio was higher on part-time households suggesting a somewhat more labor-intensive enterprise mix.

Korea households reported using substantially less total household labor days on farms than in Taiwan. In 1969, the average was only 132 days and part-time households spent about half as many days on the farm as did full-time households. There may be some unknown differences between the definitions used in the Taiwanese and Korean surveys which would explain some of this difference. Unlike in Taiwan, full-time households spend more on machinery expenses, and almost as much on hired labor as part-time households. Furthermore, full-time households use significantly more animal labor days per hectare, while part-time Taiwanese farms spent substantially more than full-time households on animal labor. Educational differences were not significant between the two groups of households, but full-time households had a slightly greater proportion of total adults between 20 and 55 years of age relative to the total number of adults in the household.

Model Results

The results for the estimates of the off-farm earnings model are presented in Table 26. All regressions were significant at the one percent level and the adjusted coefficient of determination ($\bar{R}^2$) ranged from .20 to .23. Thus, the model explained less variation in Korean off-farm earnings than in Taiwan.

The on-farm wage rate variable, W_1, was insignificant in all regressions, but would have been significant for a two-tailed t test for full-time households. There appears to be no theoretical reason, however, to expect on-farm wage rates to be positively associated with off-farm earnings. The off-farm wage coefficient, W_2, was positive and significant for all three groups. The elasticities

TABLE 26: Regression Coefficients and Related Statistics for Sample Households, Korea, 1969

Variables	Entire Sample			Full-Time Farm Families			Part-Time Farm Families		
	Regression Coefficient	Elasticities of Off-Farm Earnings	T-Value	Regression Coefficient	Elasticities of Off-Farm Earnings	T-Value	Regression Coefficient	Elasticities of Off-Farm Earnings	T-Value
Intercept	33,588			16,810			22,837		
W_1	-0.09	0.00	0.48	0.35	0.02	2.57	0.26	0.00	0.10
W_2	0.89	0.11	10.19**	0.88	0.11	8.89**	0.46	0.06	3.36**
A	8,450	0.50	5.87**	4,160	0.37	3.68**	11,330	0.28	3.00**
B	-83	-0.01	0.08	-585	-0.06	0.77	1,153	0.03	0.40
L	-11,810	-0.32	5.23**	2,460	0.11	1.39	21,120	0.13	2.10
X	74	0.00	0.03	-2,720	-0.12	1.15	4,680	0.06	0.50
F	-2,480	-0.01	1.35	-8,850	-0.06	1.34	-4,430	-0.02	1.84
S	-0.19	-0.01	1.21	-0.06	-0.01	0.52	0.62	0.01	0.66
H	0.64	0.12	5.38**	0.28	0.08	2.81**	0.98	0.09	3.77**
G	-307	-0.04	1.02	135	0.03	0.59	1,325	0.06	1.26
C	38,300	0.06	4.53**	28,250	0.06	4.00**	35,870	0.03	1.97**
K	-6,410	-0.09	1.01	-1,730	-0.03	0.35	14,560	0.07	0.86
$\bar{R}^2$	0.22758			0.22472			0.20556		
F-ratio	22.39**			18.15**			4.45**		
D.F.	(12,854)			(12,698)			(12,148)		

* Significant at .05 level.

** Significant at .01 level.

were low, varying from .06 to .11. The estimates for Taiwan produced inelastic results also, but generally more elastic than these estimates. The variable for number of adults, A, was also positive and significant as expected. Again, the results were more inelastic than found in Taiwan. The number of dependents, B, produced insigificant coefficients with variable signs.

Surprisingly, the variable for farm size, L, had a negative and significant influence on off-farm earnings, as expected, for the entire sample, but the coefficient was positive and insignificant for the two subgroups. The coefficients for the variables for cropping index (X), farm receipts ratio (F), and machinery expenses (S), were all insignificant and had variable signs for the three regressions. The coefficient for hired labor expenses, H, was positive, as expected, and significant for all regressions. The elasticity estimates were quite inelastic, varying from .08 to .12. Animal labor days per hectare, G, however, was insignificant with a variable sign.

The education variable, C, was significant in all three regressions with a positive sign. As the proportion of household members with higher education increases, off-farm earnings increase. A one percent increase in the ratio is associated with a .03 or .06 percent increase in off-farm earnings for part-time and full-time households, respectively. The age variable, K, however did not produce the positive result that was expected.

The correlation coefficients for these models are reported in Appendix Tables 16, 17 and 18. As in the Taiwanese case, the highest correlation was between farm size, L, and number of adults, A. As farm size increases, so do number of adults. Thus, the coefficients for these variables may be somewhat biased. It appears that the number of adults in a household is related to the amount of land which supports them. It is likely that if family size grows

without a corresponding change in farm size, some members of the household will be forced to migrate to look for employment.

CONCLUSIONS

Off-farm income represented about 20 percent of net household income for Korean farmers during the entire 1962-1976 period. There has not been a continued increase in share of off-farm income as found in Taiwan. Part of the explanation is that nonagricultural activities have been concentrated in a few geographic areas in Korea so there has not been the opportunity for farm households to earn as much off-farm income. Only in the past few years has the government emphasized development in rural areas. The Saemaul Undong movement may help provide more off-farm work opportunities in rural areas in the future.

Labor income is the most important source of off-farm income representing about 40 percent of the total. Sideline business, another source of labor earnings, represents another 20 percent.

As in Taiwan, small farm households earn a larger share of household income from off-farm sources. Also, low farm income households tend to earn more off-farm income so that the distribution of household income is more equal than the distribution of farm income. Income distribution in Korea is about as equally distributed as Taiwanese households.

Daily off-farm wage rates were greater than on-farm wage rates for both full-time and part-time households. The difference was much greater for part-time households however. Part-time households appeared to allocate relatively more household labor to off-farm work and less to farm work than full-time households.

The off-farm earnings model explained less of the variation in off-farm earnings in Korea than in Taiwan, but several of the same factors were found to be important. Increases in off-farm wage rates, number of adults in the household, hired labor expense, and education were associated with higher off-farm earnings. The farm size variable was negatively correlated with off-farm earnings in the model for the entire sample, but surprisingly insignificant for the models for the two subgroups. The elasticities for all variables were low, indicating a less than proportional increase in off-farm earnings with a given increase in the independent variables.

CHAPTER VI

CONCLUSIONS AND POLICY IMPLICATIONS

This study analyzed off-farm earnings and time allocation of farm households with an emphasis on Taiwan and Korea. The several conclusions which emerge are summarized in this section and policy implications are discussed in the following section. Priority research issues are discussed in the last section.

CONCLUSIONS

Farm Household Income and Labor Allocation

Off-farm earnings represent a substantial share of total farm household income. The share varies from less than 10 percent to over 80 percent of household income. There is a logical pattern to off-farm earnings. Households with little or no land must earn proportionately more off-farm income to reach subsistence or desired income levels. Larger families tend to earn more off-farm income since they require more total income than small families and may have more potential labor to supply to off-farm work.

Since off-farm earnings tend to be negatively correlated with farm size and farm income, the distribution of household income tends to be less concentrated than the distribution of farm income alone. This point emerges most clearly from our analysis of farm record-keeping families in Taiwan. In spite of a more equitable farm income distribution than found in many other low-income countries, due in part to post World War II land reform, there has been a surprising concentration in farm incomes during the past 15 years. Households with low farm income apparently compensated, however, by earning

proportionately more off-farm income, so total household income distribution has been relatively unchanged. It is likely that household income distribution would have sharply deteriorated if off-farm opportunities would have been less abundant.

The primary sources of off-farm income tend to vary for households of different income levels, and the relative importance of various sources is likely to change over time. For low-income households, off-farm earnings in the form of wages and salaries are predominant. High income households tend to earn proportionately more income from capital in the form of rents, interest and dividends. This latter source is likely to increase in importance over time as average income levels rise.

Farm households participate in fluid and dynamic labor markets and appear to be rational in the allocation of household labor supplies. When time allocation is carefully recorded, households spend substantial amounts of time in a wide range of activities classified as off-farm work. This evidence supports the argument of little un- and under-employment of farm household labor. In fact, employment of children may be excessive and anti-social in terms of its impact on education and human capital formation. Previous farm management studies showing large amounts of surplus farm labor may suffer from inadequate documentation of productive activities not directly related to crop and livestock production.

Off-farm work tends to offset some of the seasonality of farm labor demand. The limited evidence available on time allocation by month or season suggests that off-farm work is negatively correlated with farm labor demand. In peak periods, off-farm work is limited. In slack seasons, off-farm work tends to increase.

Intra-household time allocation appears to be related to expected patterns of relative productivity of household members. Adult males tend to work a larger proportion of their total work time off the farm than other household members. It is likely that they earn higher off-farm wages. Women and children appear to spend less time in off-farm work, and it would be expected that women would be most productive in home production, including child care. Children are reported to spend proportionately more time in work with lesser skill requirements such as herding livestock and bird chasing. Local unskilled labor is hired for some of these farm tasks in order to release adults and skilled household labor for off-farm work.

As further evidence of the rationality of time allocation, the Taiwanese data tend to show that part-time farm households earn higher off-farm wage rates than on-farm wage rates. Over time, there has been a shift of relative wages in favor of off-farm work and households have responded by increasing the off-farm labor supply. There are obvious limitations in the measurement of these wage rates, however, so much additional research is required before off-farm labor supply can be understood in terms of a response to wages versus off-farm employment opportunities.

Rural Development Strategies

Rural development strategies are related to farm household time allocation. Opportunities for off-farm employment would appear to be an obvious factor influencing off-farm work by farm households. Location, access to markets, geographic isolation, etc., would be expected to influence the magnitude and pattern of off-farm work within a country. Furthermore, inter-country comparisons suggest that the development strategy employed by a

country may also be a crucial factor. Taiwan, for example, has pursued a fairly consistent small-scale, labor-intensive development strategy in recent years. This strategy appears to be conducive to creating a large amount of off-farm employment. The development pattern in Korea, on the other hand, with more concentrated industrial activity appears to be less conducive to the development of rural off-farm employment opportunities. It is not surprising then that off-farm earnings represent an increasing share of farm household income in Taiwan, while in Korea, the growth of off-farm income has just kept pace with farm income.

It was not our objective to analyze economic development strategy in detail but the brief literature review reported in Chapter II along with Liedholm's (1973) summary of the African experience suggest that small-scale, labor-intensive firms and nonfarm enterprises offer important advantages compared to large-scale, capital-intensive firms. An important advantage is the opportunity for farm households to earn off-farm earnings. Thus, encouragement of small-scale nonfarm enterprises could have a significant impact on the nature, composition and importance of off-farm work for farm households.

A Caveat on Part-Time Farming and Agricultural Productivity

Encouraging off-farm employment as a rural development strategy offers several appealing advantages as noted above. We would be remiss, however, if we didn't add a note of caution regarding agricultural productivity. The Japanese experience suggests that part-time farming has been associated with a decline in agricultural productivity and efficiency. Average returns to land, labor and capital tend to be lower on part-time compared to full-time farms. This would be expected when farm work is left to older people,

women, and children, while husbands and/or wives work off the farm. We are aware of no comparable studies for Taiwan, but noted a decline in the multiple cropping index in recent years with part-time farms having a lower index than full-time farms. Several factors could explain this result, but increasing amounts of time spent on off-farm work may be a contributing factor.

POLICY IMPLICATIONS

The policy implications of this study are divided into those largely affecting agricultural development planning versus those focusing on off-farm employment in rural areas.

Agricultural Development

The chief implication of this research for agricultural development plans and programs is that the multiple activities of farm households need to be taken into account. First, rural poverty may not be as serious as appears to be the case when only on-farm activities are considered. Since this study focused on landowning households, we cannot say how this conclusion may be modified when landless households are also considered. Second, activities for increasing agricultural output such as improved technology, new enterprises, double cropping, irrigation, etc., may encounter resistance if insufficient attention is paid to their effects on the quantity and pattern of farm labor requirements. Our suspicion is that family labor should not be charged a zero opportunity cost, as is frequently the case with farm management plans which focus almost exclusively on crop and livestock production. Households will not value family labor at zero cost if they have

remunerative off-farm work. The amount of foregone off-farm earnings associated with a new agricultural activity may surpass the additional farm returns.

There is another potential development implication not addressed in this research. Many countries assume that large amounts of new credit will be required to facilitate agricultural growth and modernization. This may be true in many cases. Off-farm earnings, however, provide additional liquidity to a household. This liquidity may help farmers self-finance a larger proportion of farm costs than would be possible with farm earnings alone.

Off-Farm Employment and Rural Nonfarm Enterprises

A number of policies and programs can be employed to accelerate: a) the demand for off-farm employment by rural nonfarm enterprises and b) the off-farm labor supply of farm households.[16/] This section highlights some of the alternatives.[17/]

Efforts to increase farm mechanization, improve rural education and reduce rural transportation costs appear to be most important in increasing off-farm labor supply. Increased farm mechanization is associated with more off-farm work. Many countries fear mechanization because of its potential displacement of farm labor. However, a selective pattern of farm mechanization

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16/ Some of these arguments are drawn from Meyer and Larson (1978).

17/ Staley and Morse (1965) and Vepa (1971) provide comprehensive reviews of small-scale industry problems and needs. Two recent World Bank papers by Anderson and Leiserson (1978) and Gordon (1978) identify and analyze some of the key policy alternatives with an emphasis on the role of international lenders.

designed to reduce peak labor constraints could release labor for both increased agricultural production and off-farm work. Johnston and Kilby (1975) emphasize how the unimodal size distribution of Japanese and Taiwanese farms facilitate broad based intermediate-size mechanization where power tillers and other implements are produced by local industries. On the other hand, countries with a bimodal farm distribution that choose a capital-intensive agricultural strategy are more likely to import machinery. Therefore, the careful introduction of appropriate mechanical technology can increase demand for small industry products as well as increase the supply of off-farm work by farm families.

Hu (1975) found that education is positively associated with off-farm work in Taiwan and our results showed the same for Korea. Thus, it would appear that increased rural education could provide several benefits. First, education levels are frequently associated with the decision to migrate due to the higher probability of obtaining employment and earning a higher income. Secondly, education levels of farmers have been linked to increased productivity and adoption of new farming techniques. Thirdly, education may also increase the probability of members of farm households to obtain part- or full-time off-farm work and increase their remuneration for such employment.

Transportation and commuting costs reduce the net wage received in off-farm work. Improvements in transportation, therefore, could increase net wages and may encourage people to commute further and work a longer period off the farm. Investments in rural transportation are often justified because of the expected decrease in farm marketing costs, but the impact on the supply of off-farm work may also be substantial. Likewise,

industrial decentralization increases the availability of jobs and reduces commuting costs by bringing jobs closer to the farms. The large amounts of off-farm work reported in several countries suggest that a sizeable pool of labor can be mobilized in rural areas frequently at wage rates lower than in the urban areas.[18/]

The greatest impact on off-farm work, however, may be realized through assistance to the small-scale, nonfarm firms which utilize much of the off-farm employment. Improved access to credit appears to be crucial in many cases. David Kochav et al. (1974) reviewed the financial needs of small-scale industries in several low-income countries. Child and Kaneda (1975) also analyzed the capital structure and credit sources for small-scale agriculturally related firms in West Pakistan. Vepa (1971) reviewed financial problems of small-scale firms and discussed the programs employed in Asian countries to meet their needs. These studies conclude that small-scale industries are usually started with personal or family savings and little borrowed capital. Expansion capital also usually comes from savings. Formal credit for working capital appears to be relatively more obtainable. Much of the credit used by small-scale firms, however, comes from informal sources. For example, Kochav et al. (1974) found small Korean industrial firms borrowing from the informal market with interest rates of 35 to 40 percent, while the prevailing rate for short-term loans from formal sources was 17.5 percent. In the absence of sufficient formal sources of credit,

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18/ Planners for large rural industrial projects have frequently been surprised to find that in-migration was less than expected because local persons, previously not in the labor force, absorbed most of the jobs created.

small enterprises in many countries were also found to be highly dependent upon credit from input suppliers and purchasers.

A problem in interpreting such findings is to ascertain whether the limited use of formal credit is due to supply or demand problems. Many researchers feel the supply side is most important because of lenders reluctance to lend to small firms. First, risks may be higher since small-scale firms typically have few reserves to withstand poor market conditions or interruptions in production. Second, profit potential may be less for small loans. Administrative costs tend to be high for small loans, as a portion of lending costs are fixed and are independent of loan size. Small firms are heterogeneous and widely dispersed so it is difficult for the lender to develop the kind of familiarity characteristic of lending to larger firms. Furthermore, larger firms frequently hold substantial bank deposits which can be lent out to increase the lender's earnings.

Internal credit rationing presents an alternative explanation of limited formal credit use by small-scale firms. The current large-scale, capital-intensive bias may destroy production incentives for existing small-scale firms and impede the creation of new ones; thus, there may be little demand for credit. Furthermore, complex and unfamiliar lending procedures by formal lenders may raise total borrowing costs for small firms so high that informal credit is actually cheaper.[19/] Informal lenders lend quickly, require less documentation, and lend for a variety of purposes so frequently they are a preferred source of credit. Borrowing from suppliers and purchasers

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19/ Adams and Nehman (1978) argue that borrowing costs for formal credit for small farmers are high. Thus they are encouraged to use what appears to be more expensive informal credit.

may be costly, but may offer an advantage by assuring a reliable supply of inputs and more stable markets. Thus, formal credit may not be a direct substitute for informal sources.

Changes in rural financial markets could remove some of the supply and demand constraints for credit facing small-scale firms. Usury laws and other credit controls must be examined for their impact on lender behavior. Interest rates in many countries are fixed at such low levels that commercial banks cannot cover lending costs on small loans.[20/] Thus, lenders impose noninterest costs on small borrowers to raise the real return from loans as well as discourage some applicants. Furthermore, the lack of innovativeness by bank management regarding small loans may disappear if this type of business was made more profitable. Kochav et al. (1974) report that some countries have attempted to make small-scale loans more attractive by reducing default risks through guarantee funds. Others have established special funds and rediscount arrangements. Still others have requested or directed commercial banks to increase small loan activities. In Korea, for example, commercial banks were requested to direct 30 percent of their lending to small and medium-sized enterprises employing 5 to 200 workers.

In spite of these efforts, commercial bank lending to small-scale firms continues to be marginal in many countries so other solutions have been proposed. Many countries have development banking institutions with potential

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20/ Gonzalez-Vega (1976) argues that subsidized interest rates discourage lending to small farmers. Raising interest rates may actually encourage more small farmer lending by commercial banks. Araujo and Meyer (1977) argue that farm credit distribution in Brazil was distorted due to interest rate controls.

for expansion in size and function. They have experienced staff and they also have access to domestic and external funds. As a result, it has been proposed that a special unit be created to service small-scale enterprises. A problem with this proposal is that these lenders are geared to clients borrowing large amounts frequently at concessional interest rates. It is feared that it would be difficult for them to give adequate priority to smaller clients.

Specialized small industry financial institutions represent a third alternative method to service small-scale firms. For example, Japan created several specialized institutions including the Central Bank for Commercial and Industrial Cooperatives and the Small Business Finance Corporation; Taiwan has a Chinese Development Corporation; and Korea has a Medium Industry Bank. While these institutions have increased the supply of funds to small firms, similar efforts in other countries have been less successful due to the limited number of branches located in rural areas, interest rate policies, and the lack of competent staff.

Other types of special assistance for small-scale firms are being provided in some countries. These include: (1) preparation of financial plans and loan applications to lenders, (2) organizing systems to acquire and distribute raw materials and equipment, (3) preparation of projects for expansion and modernization, and (4) production management and control. These services are made available through supervised lending programs or through special institutions created for technical assistance and extension activities. Industrial estates have been created in several countries, especially India, to attract industry by developing land, infrastructure, services and

occasionally building factory shells.[21] The Korean Saemaul or new village movement includes development of estates, construction of plants, provision of equipment and working capital, tax concessions, and establishment of home industry centers to assist rural cottage industries (Lodge and Auciello, 1975).

PRIORITY RESEARCH ISSUES

Much remains to be learned about off-farm employment and rural nonfarm enterprises in developing countries. The priority research needs can be categorized as a) studies of off-farm labor supply, b) studies of rural nonfarm firms which employ off-farm labor, and c) analysis of the impact of policies on the small-scale sector.

The several studies cited in this report shed light on aspects of off-farm employment but many additional studies are required to resolve several remaining uncertainties. Off-farm labor supply models must be specified more appropriately than possible in our study of Taiwan and Korea. Additional work is required on specification of the on-farm and off-farm wage variables. The reservation wage concept currently being explored by Professor Robert Evenson of the Yale Growth Center offers promise.

A more complete household time allocation model is required where off-farm work is analyzed relative to alternative assumptions about farm labor demand. Our study of Taiwan and Korea assumed that variables, such as enterprise mix, are predetermined in the agricultural year; thus, off-farm work is allocated assuming that farm labor demand is largely fixed.

21/ Kochav et al. conclude that on the whole industrial estates have not been very cost effective in promoting small-scale industries. Mars (1975) analyzed four estates in Kerala, India and found they were recruiting entrepreneurs from sophisticated rather than low status social groups.

Furthermore, separate models are required for husbands, wives, and perhaps even children to analyze the determinants of time allocation by age and sex. Evenson (1977) reported on the results of testing such a model for the Philippines. The relatively simple time allocation model, such as the one used in our analysis, will likely give way eventually to more complex models which attempt to integrate farm production and consumption.

Much of the analysis to date has focused on landholding households. Labor response studies are required for landless households as well in order to more adequately assess the prospects of ameliorating the poverty of the landless through off-farm work.

Additional analysis is required to separate the effects on off-farm work of increased employment opportunities versus increased wage rates. It is unclear the extent to which farm households would be willing to increase their off-farm supply of labor with constant wages. Even in countries where unemployment is low, farmers may be unable to find additional work at existing wages. Thus, the fairly inelastic supply of off-farm labor noted in the study may be associated with limited off-farm employment opportunities.

In order to facilitate the research which is required on off-farm labor supply, much more detailed and comprehensive data are required on farm household time allocation and attitudes on farm and off-farm work. We need to know much more about which persons in the household perform various farm and off-farm tasks, the type of off-farm activities in which household members are engaged, the schedule of such work (part-time or full-time, seasonal or year-round), and the level of remuneration received.

Fortunately, there appears to be increased interest in some of these issues and we were able to identify other researchers with data sets that may be useful in this research. These sources are catalogued in Meyer and Smith (1978).

Finally, research is required to determine how off-farm labor affects agriculture. It is possible that a rural development strategy to encourage off-farm work may also contribute to a rigid agricultural structure detrimental to long-term growth and productivity. Thus, the solution to a short-term problem may create long-term problems.

Studies on the demand for rural nonfarm employment are equally necessary. Carl Liedholm and associates at Michigan State University are currently providing leadership in this area, especially concerning the productivity and efficiency of small scale nonfarm firms. A state of the arts paper is in preparation which will help clarify the research issues to be addressed. It appears that additional research to identify the constraints faced by nonfarm enterprises is crucial before we can correctly access how incentives can be provided through policies and programs. The possible role of credit and technical assistance needs to be carefully assessed as they represent two types of assistance frequently employed by domestic and international agencies.

Finally, studies are required of past efforts to stimulate rural nonfarm enterprises. Several countries have employed several different types of programs and institutions oriented to this sector. More evaluations are required of these experiences to determine a) if the participants progressed any faster than nonparticipants and b) if the rural nonfarm sector would have progressed as well without the special incentives.

CONCLUDING REMARKS

The benefits of a more broadly based rural development strategy are becoming increasingly clear. The past over-reliance on large-scale, capital-intensive industrialization to pull labor from agriculture can now be seen as the cause of some of the employment and income distribution problems found in many countries. These problems require a change in strategy with increased attention on small-scale farm and nonfarm firms. Assisting these heterogeneous firms presents great challenges. Furthermore, our will and ability to assist them will be tested as their needs may be more difficult to address through traditional capital and technical assistance programs.

By focusing on off-farm work, we have tried to provide additional insights into a frequently ignored dimension of rural development. The policy implications we have suggested must be field tested, however, before we can confidently determine how increased integration of farm and nonfarm labor markets affects development. Rural development problems are not likely to give way to simple strategies but we cannot overlook the potential benefit of rural nonfarm activities including their impact on employment and income of farm households.

APPENDIX TABLE 1: Farm and Off-Farm Receipts and Income, United States, 1960-1976

Year	Household Receipts[a]			Household Income[b]		
	Total	Off-Farm	Percent Off-Farm	Total	Off-Farm	Percent Off-Farm
1960	11,855	2,140	18.1	4,946	2,140	43.3
1961	12,907	2,396	18.6	5,434	2,396	44.1
1962	13,983	2,683	19.2	5,782	2,683	46.4
1963	15,049	3,085	20.5	6,204	3,085	49.7
1964	15,841	3,366	21.2	6,638	3,366	50.7
1965	17,351	3,792	21.9	7,325	3,792	51.8
1966	19,783	4,262	21.5	8,574	4,262	49.7
1967	20,355	4,584	22.5	8,279	4,584	55.4
1968	21,879	5,036	23.0	9,008	5,036	55.9
1969	24,314	5,539	22.8	10,272	5,539	53.9
1970	25,699	5,874	22.9	10,662	5,874	55.1
1971	27,289	6,456	23.7	11,006	6,456	58.7
1972	31,594	7,160	22.7	13,364	7,160	53.6
1973	41,918	8,335	19.9	18,864	8,335	44.2
1974	44,642	9,330	20.9	19,131	9,330	48.8
1975	44,568	10,148	22.8	17,558	10,148	57.8
1976	48,477	11,174	23.1	19,059	11,174	58.6

Source: USDA/ERS, Farm Income Statistics, Statistical Bulletin No. 576, Washington, D.C., July 1977.

a/ Household receipts are the sum of realized gross farm income plus off-farm income. Realized gross farm income includes cash receipts from marketings, government payments, nonmoney income, and other income including machine hire and custom work. Off-farm income includes wages, salaries, business income, interest, transfer payments, nonfarm rent, dividends and royalties.

b/ Household income is the sum of realized net income plus off-farm income. Realized net income is defined as realized gross farm income minus farm production expenses.

APPENDIX TABLE 2: Average Farm Household Receipts, Japan, 1960-1975

Year	Total	Source		Percent Nonagricultural
		Cash Farm Receipts[a]	Nonagricultural Receipts[b]	
		1,000 Yen		
1960	480.3	247.5	232.8	48.5
1961	550.8	280.8	270.0	49.0
1962	675.8	342.2	333.6	49.4
1963	769.5	382.5	387.0	50.3
1964	890.5	437.0	453.5	50.9
1965	1,015.0	505.8	509.2	50.2
1966	1,168.5	585.9	582.6	49.9
1967	1,387.2	713.4	673.8	48.6
1968	1,536.9	758.5	778.4	50.6
1969	1,738.2	798.6	939.6	54.1
1970	1,977.3	815.9	1,161.4	58.7
1971	2,201.5	809.3	1,392.2	63.2
1972	2,633.9	964.8	1,669.1	63.4
1973	3,291.6	1,220.7	2,070.9	62.9
1974	4,174.0	1,546.6	2,627.4	62.9
1975	4,830.8	1,838.9	2,991.9	61.9

Source: Study Group on Agricultural and Forestry Statistics, Annual Statistics of Agricultural Economy, Vol. 1, Farm Household Economic Survey, Tokyo, 1974.

a/ Includes cash receipts from farm marketings.

b/ Includes wages, salaries, income from investments, government transfers, family remittances, gifts, etc.

APPENDIX TABLE 3: Numbers of Major Agricultural Machines Taiwan, Selected Years

	1960	1965	1970	1971	1972	1973	1974	1975
Power tiller	3,708	12,213	28,292	32,030	35,222	38,393	42,123	48,598
Tractor	-	425	539	554	620	749	892	1,467
Rice transplanter	-	-	280	454	658	972	1,914	2,787
Power sprayer	317	4,489	17,820	27,038	25,309	43,176	45,399	-
Water pump	8,378	32,107	52,794	61,660	65,755	112,998	119,905	
Rice thresher	177,338	205,784	186,398	195,784	196,637	177,714	135,158	-
Power thresher (with cleaning device)	-	-	-	-	146	316	379	2,816
Grain dryer (bin- and circulation-type)	-	150	198	214	361	708	1,008	1,683
Rice combine	-	-	20	75	154	329	1,127	2,053

Source: Reproduced from Shen (1976).

APPENDIX TABLE 4: Price Indices, Foreign Exchange Rates and Bank Interest Rate, Taiwan, 1953-1975

Year	Price Indices (1975=100) Wholesale	Price Indices (1975=100) Consumer	Foreign Exchange Rates (per US$) Official Rates Buying	Foreign Exchange Rates (per US$) Official Rates Selling	Interest Rates (% per Annum) Banks Secured Loans	Interest Rates (% per Annum) Banks Time Deposits
1953	26.65	22.94	15.55	15.65	27.00	16.20
1954	27.29	23.32	15.55	18.78	23.40	10.80
1955	31.13	25.64	21.55	24.78	21.60	10.80
1956	35.08	28.33	24.68	24.78	21.60	10.80
1957	37.61	30.46	24.68	24.78	19.80	10.20
1958	38.14	30.85	36.085	24.78	19.80	10.20
1959	42.06	34.11	36.08	36.38	18.00	9.00
1960	48.01	40.40	40.00	40.10	18.00	9.00
1961	49.56	43.57	40.00	40.10	16.20	7.20
1962	51.07	44.60	40.00	40.10	15.84	6.48
1963	54.37	45.57	40.00	40.10	14.04	6.00
1964	55.71	45.49	40.00	40.10	14.04	6.00
1965	53.12	45.46	40.00	40.10	14.04	6.00
1966	53.91	46.83	40.00	40.10	14.04	6.00
1967	55.27	47.93	40.00	40.10	13.32	5.40
1968	56.91	51.71	40.00	40.10	13.32	6.48
1969	56.77	54.33	40.00	40.10	13.32	6.48
1970	58.31	56.27	40.00	40.10	12.60	6.24
1971	58.39	57.85	40.00	40.10	12.00	6.50
1972	60.99	59.58	40.00	40.10	11.25	6.25
1973	74.94	64.46	37.90	38.10	13.25	8.00
1974	105.34	95.06	37.95	38.05	14.75	10.00
1975	100	100	37.95	38.05	13.25	8.50

Source: Taiwan Statistical Data Book 1976, Economic Planning Council, Executive Yuan, Taiwan, R.O.C.

APPENDIX TABLE 5: Simple Correlation Coefficient Matrix, Taiwan, 1960

	W_1	W_2	V	A	B	S	F	L	X	H	G	E
W_1	1.00											
W_2	-0.11	1.00										
V	-0.50	0.11	1.00									
A	0.12	-0.21	-0.05	1.00								
B	-0.01	-0.16	0.08	0.43	1.00							
S	-0.01	-0.05	0.17	-0.09	0.02	1.00						
F	-	-	-	-	-	-	1.00					
L	0.13	-0.05	-0.05	0.31	0.25	-0.09	-	1.00				
X	0.20	0.09	-0.06	-0.15	-0.21	0.07	-	0.46	1.00			
H	-.025	0.21	0.50	-0.26	-0.13	0.52	-	-0.13	0.02	1.00		
G	-0.06	0.35	-0.00	-0.23	-0.15	0.30	-	-0.14	0.15	0.26	1.00	
E	-0.15	0.45	0.16	0.15	0.05	-0.04	-	0.12	-0.01	0.12	0.12	1.00

APPENDIX TABLE 6: Simple Correlation Coefficient Matrix, Taiwan, 1965

	W_1	W_2	V	A	B	S	F	L	X	H	G	E
W_1	1.00											
W_2	-0.00	1.00										
V	0.09	0.00	1.00									
A	-0.08	-0.09	0.06	1.00								
B	0.05	0.00	0.00	0.27	1.00							
S	0.08	-0.00	0.01	-0.06	-0.00	1.00						
F	0.00	0.02	-0.03	0.02	-0.01	-0.00	1.00					
L	0.07	-0.04	0.16	0.44	0.34	-0.07	-0.08	1.00				
X	0.05	0.00	-0.03	-0.07	-0.08	0.06	-0.24	-0.04	1.00			
H	0.11	-0.01	0.11	-0.10	-0.08	0.23	-0.16	-0.05	0.27	1.00		
G	-0.02	-0.00	-0.05	-0.13	-0.14	0.06	-0.09	-0.27	0.21	0.21	1.00	
E	-0.07	0.13	0.06	0.14	0.08	0.01	0.09	-0.08	-0.00	0.06	0.12	1.00

APPFNDIX TABLE 7: Simple Correlation Coefficient Matrix, Taiwan, 1968

	W_1	W_2	V	A	B	S	F	L	X	H	G	E
W_1	1.00											
W_2	-0.07	1.00										
V	0.00	0.04	1.00									
A	0.01	-0.15	0.18	1.00								
B	0.11	0.00	0.04	0.29	1.00							
S	0.07	0.04	0.16	0.12	0.09	1.00						
F	0.13	0.03	0.01	-0.11	-0.07	0.09	1.00					
L	0.03	-0.07	0.23	0.38	0.27	-0.07	-0.22	1.00				
X	0.01	-0.02	0.02	0.10	-0.01	0.10	-0.24	-0.23	1.00			
H	-0.08	0.06	0.19	-0.10	-0.14	0.14	-0.14	-0.08	0.27	1.00		
G	-0.09	0.06	-0.01	-0.11	-0.08	0.02	0.00	-0.26	0.19	0.18	1.00	
E	-0.07	0.35	0.20	0.24	0.08	0.17	0.13	-0.03	0.03	0.11	0.08	1.00

APPENDIX TABLE 8: Simple Correlation Coefficient Matrix, Taiwan, 1970

	W_1	W_2	V	A	B	S	F	L	X	H	G	E
W_1	1.00											
W_2	0.00	1.00										
V	-0.03	-0.01	1.00									
A	-0.01	-0.10	0.09	1.00								
B	0.12	0.08	0.06	0.14	1.00							
S	0.17	-0.01	-0.02	-0.00	0.01	1.00						
F	0.08	-0.02	0.02	-0.03	-0.14	-0.07	1.00					
L	0.01	0.15	0.17	0.32	0.23	-0.11	-0.13	1.00				
X	0.04	-0.12	-0.00	0.06	0.01	0.13	-0.03	-0.03	1.00			
H	0.10	0.01	0.03	-0.03	-0.08	0.24	-0.12	-0.13	0.31	1.00		
G	-0.08	0.01	-0.03	-0.10	-0.02	0.06	-0.04	-0.14	0.10	0.16	1.00	
E	-0.15	0.10	0.20	0.31	0.09	0.05	-0.03	-0.08	0.09	0.12	0.07	1.00

APPENDIX TABLE 9: Simple Correlation Coefficient Matrix, Taiwan, 1973

	W_1	W_2	V	A	B	S	F	L	X	H	G	E
W_1	1.00											
W_2	-0.05	1.00										
V	-0.01	-0.02	1.00									
A	0.04	-0.18	0.26	1.00								
B	-0.05	0.04	-0.00	0.06	1.00							
S	0.02	0.01	0.01	0.07	-0.02	1.00						
F	0.06	0.03	-0.09	0.00	-0.15	0.08	1.00					
L	0.11	-0.13	0.28	0.35	0.20	-0.11	-0.13	1.00				
X	0.04	0.00	0.06	0.01	0.04	0.05	-0.18	-0.20	1.00			
H	-0.07	0.04	0.05	-0.11	-0.07	0.11	-0.16	-0.17	0.28	1.00		
G	0.01	0.07	-0.04	-0.10	-0.06	-0.00	-0.03	-0.21	0.11	-.10	1.00	
E	-0.14	0.58	0.09	0.16	-0.07	0.02	-0.06	-0.21	0.04	0.15	0.17	1.00

APPENDIX TABLE 10: Average Values for Characteristics of Full-Time Farm Families, Taiwan, 1965, 1968, 1970, and 1973

Characteristics[a]	Years 1965	1968	1970	1973	F-Ratio[b]
No. of Observations	465	387	357	331	
General					
Farm Income	51,423	61,319	52,782	69,077	15.81**
Farm Size	1.44	1.61	1.62	1.66	2.92*
Cropping Index	212.2	206.8	186.0	191.2	14.99**
Daily Farm Wage Rate	75.20	63.20	56.10	86.30	3.04*
Daily Off-Farm Wage Rate	27.10	25.70	63.60	33.50	4.32**
No. of Adults	3.99	4.39	4.30	4.76	7.80**
No. of Dependents	4.27	4.21	3.80	3.42	10.47**
Off-Farm Income					
Sideline and Wage	6,015	7,477	10,593	19,442	76.85**
Nonearnings Income	4,536	6,189	5,968	11,941	22.17**
Labor-Related Variables					
Total Family Farm Labor	451.9	543.8	456.1	396.6	19.71**
Machinery Expense per ha.	1,470	977	1,749	1,862	2.72*
Hired Labor Expense per ha.	3,093	3,407	4,309	5,329	23.79**
Animal Labor Expense per ha.	409	375	319	310	1.62
Farm Receipts Ratio[c]	0.31	0.35	0.37	0.43	18.98**

a Monetary values are shown in 1973 NT$, deflated using wholesale prices.

b F-ratio is equal to = between-groups mean square/within-group mean square. The degree of freedom for all characteristics in table are 3 and 1536 for the numerator and denomenator, respectively.

c The farm receipts ratio is defined as the ratio of receipts from vegetables, fruit, livestock and poultry to total farm receipts.

* Significant at 0.05 level.

** Significant at 0.01 level.

APPENDIX TABLE 11: Regression Coefficients and Related Statistics,"Full-Time Farm Families," Taiwan, 1965, 1968, 1970, and 1973

Independent Variables	1965			1968			1970			1973		
	Regression Coefficient	Elasticities of Off-Farm Earnings	T-Value	Regression Coefficient	Elasticities of Off-Farm Earnings	T-Value	Regression Coefficient	Elasticities of Off-Farm Earnings	T-Value	Regression Coefficient	Elasticities of Off-Farm Earnings	T-Value
1. Intercept	-268.5	—	—	708.2	—	—	-902.7	--	—	1895.7	—	
2. W_1	7.40	0.09	1.02	-3.44	-0.03	0.81	-12.57	-0.07	1.23	0.42	0.00	0.16
3. W_2	7.61	0.04	2.90**	47.84	0.17	7.58**	7.53	0.05	3.53**	362.9	0.63	18.69**
4. V	0.09	0.07	2.29	0.11	0.09	2.82	0.23	0.13	4.32	0.13	0.08	3.10
5. A	803.8	0.75	5.65**	1331.7	1.03	8.34**	1459.2	0.76	5.90**	4168.9	1.02	11.75**
6. B	224.5	0.22	1.85	112.9	0.08	0.87	530.4	0.24	2.34	-819.7	-0.14	2.40**
7. S	0.02	0.01	0.31	0.77	0.10	3.59**	0.06	0.01	0.46	0.22	0.02	1.00
8. F	-17.69	-0.00	0.01	-686.7	-0.04	0.38	-472.7	0.02	0.21	-4499.6	-0.10	1.64*
9. L	-520.0	-0.18	1.85*	-1383.6	-0.39	3.80**	-1015.1	-0.20	1.87*	-2917.4	-0.25	3.93**
10. X	-1.70	-0.08	0.33	-6.90	-0.25	1.11	6.74	0.15	0.71	-15.29	-0.15	1.16
11. H	0.09	-0.05	0.64	0.02	0.01	0.10	0.13	0.05	0.89	0.05	0.01	0.35
12. G	1.56	0.11	2.75**	2.31	0.05	3.77**	0.21	0.01	0.30	-1.31	-0.02	1.16
$\bar{R}^2$		0.09626			0.33085			0.20648			0.59742	
F-ratio		5.49**			18.35**			9.42**			45.52**	
D. of F.		(11,453)			(11,375)			(11,345)			(11,319)	

* Significant at 0.05 level.

** Significant at 0.01 level.

APPENDIX TABLE 12: AVerage Values for Characteristics of "Part-Time Farm Families", Taiwan, 1965, 1968, 1970, and 1973

Characteristics[a]	Years 1965	1968	1970	1973	F-Ratio[b]
No. of Observations	36	29	47	128	--
General					
Farm Income	16,640	37,562	17,425	23,376	4.88**
Farm Size	0.56	1.20	0.71	0.84	6.03**
Cropping Index	205.1	192.4	184.0	178.4	2.15
Daily Farm Wage Rate	46.48	17.80	11.59	-42.63	3.89**
Daily Off-Farm Wage Rate	73.60	115.90	70.00	111.70	1.48
No. of Adults	3.56	4.52	4.28	4.41	1.92
No. of Dependents	4.42	3.90	3.89	3.09	6.40**
Off-Farm Income					
Sideline and Wage	33,934	48,674	37,114	62,481	10.59**
Nonearnings Income	3,033	5,570	3,495	5,559	1.89
Labor-Related Variables					
Total Family Farm Labor	207.8	353.3	257.1	192.0	9.00**
Machinery Expense per ha.	1,148	986	2,560	2,045	0.61
Hired Labor Expense per ha.	3,807	4,316	5,195	6,362	3.97**
Animal Labor Expense per ha.	754	461	594	672	0.64
Farm Receipts Ratio[c]	0.42	0.48	0.38	0.40	1.04

a Monetary values are shown in 1973 NT$, deflated using wholesale prices.

b F-ratio is equal to = between-groups mean square/within-group mean square. The degree of freedom for all characteristics in table are 3 and 236 for the numerator and denomenator, respectively.

c The farm receipts ratio is defined as the ratio of receipts from vegetables, fruit, livestock and poultry to total farm receipts.

* Significant at 0.05 level.

** Significant at 0.01 level.

APPENDIX TABLE 13: Regression Coefficients and Related Statistics,"Part-Time Farm Families," Taiwan, 1965, 1968, 1970, and 1973

Independent Variables	1965			1968			1970			1973		
	Regression Coefficient	Elasticities of Off-Farm Earnings	T-Value	Regression Coefficient	Elasticities of Off-Farm Earnings	T-Value	Regression Coefficient	Elasticities of Off-Farm Earnings	T-Value	Regression Coefficient	Elasticities of Off-Farm Earnings	T-Value
1. Intercept	2446.5	—	—	-30477	--	--	-5595.1	--	--	-2981.5	--	—
2. W_1	58.2	0.08	1.25	-117.6	-0.04	1.43	61.82	0.02	1.34	13.88	0.01	1.14
3. W_2	298.7	0.65	4.38**	14.46	0.03	0.44	139.3	0.26	2.46**	135.6	0.24	9.83**
4. V	1.17	0.10	2.03	2.49	0.28	3.68	0.45	0.04	1.10	1.88	0.17	5.30
5. A	6974.9	1.03	3.89**	4089.8	0.50	1.67	4704.0	0.70	4.29**	7055.9	0.50	5.09**
6. B	20.3	0.01	0.01	5407.4	0.57	2.41	-1304.0	-0.18	1.28	-702.4	-0.03	0.48
7. S	0.75	0.03	0.69	4.25	0.09	1.01	-0.60	-0.04	1.35	-0.44	-0.01	1.32
8. F	-9352.8	-0.16	1.11	21627.8	0.28	0.98	7662	0.10	0.74	597.6	0.00	0.06
9. L	-12771.2	-0.30	2.27*	698.6	0.02	0.12	-106.1	-0.01	0.01	845.3	0.01	0.19
10. X	-60.77	-0.52	1.77*	13.85	0.07	0.18	-8.80	-0.06	0.21	-4.39	-0.01	0.09
11. H	-0.70	-0.08	0.88	0.07	0.01	0.04	2.18	0.31	2.58**	1.60	0.16	2.80**
12. G	2.90	0.06	1.18	0.91	-.01	0.12	2.69	0.04	0.72	3.11	0.03	1.27
$\bar{R}^2$	0.39259			0.74819			0.47056			0.57441		
F-ratio	3.06**			8.56**			4.72**			16.58**		
D. of F.	(11,24)			(11,17)			(11,35)			(11,116)		

* Significant at 0.05 level.

** Significant at 0.01 level.

APPENDIX TABLE 14: Numbers of Major Agricultural Machines

Korea, Selected Years

	1961			1968			1974		
	Total No.	No. of farms per unit	Hectares per unit	Total No.	No. of farms per unit	Hectares per unit	Total No.	No. of farms per unit	Hectares per unit
1. Power tillers	30	77,570	68,316	6,225	414	375	60,056	40	37
2. Power threshers	4,754	485	427	26,675	96	87	108,494	22	21
3. Power duster-sprayers	310	7,506	6,611	11,568	222	202	116,065	21	19
4. Power pumps	3,736	622	548	37,796	68	61	62,863	38	36
5. Plows	617,766	3	3	1,002,861	2	2	1,027,287	2	2
6. Hand dusters	9,592	242	213	48,854	52	47	134,069	18	16
7. Hand sprayers	20,975	110	97	222,361	11	10	650,268	4	3
8. Hand threshers	219,849	10	9	386,146	6	6	563,415	4	4

Source: Computed from Korean Statistical Yearbook 1975, Bureau of Statistics, EPB, Korea.

APPENDIX TABLE 15: Wholesale Price Index, Indices of Prices Received and Paid by Farmers, and Average Exchange Rate, Korea, 1962-1976

Year	Wholesale Price Index	Indices of Prices		Average Exchange Rate (in Won per U.S. Dollar)
		Received by Farmers	Paid by Farmers	
1962	38.4	27.1	31.8	130.0
1963	46.3	40.1	35.3	138.7
1964	62.3	50.2	44.8	213.3
1965	68.5	52.2	51.8	265.4
1966	74.6	55.4	58.1	271.3
1967	79.4	63.5	65.8	270.6
1968	85.8	74.3	78.8	276.6
1969	91.6	84.8	86.8	288.3
1970	100.0	100.0	100.0	310.6
1971	108.6	121.4	114.4	347.7
1972	123.8	147.9	130.5	392.9
1973	132.4	164.2	143.1	398.3
1974	188.2	215.6	192.5	404.5
1975	238.0	267.5	237.9	484.0
1976	264.6	337.8	298.8	484.0

Source: Economic Planning Board (EPB), Republic of Korea, Major Statistics of Korean Economy, 1977, and Statistical Yearbook of Korea, various years (Seoul, Korea: EPB). Reported in the unpublished M.S. thesis of Young-Key Ro.

APPENDIX TABLE 16: Simple Correlation Coefficient Matrix, Entire Sample, Korea, 1969

	W_1	W_2	A	B	L	X	F	S	H	G	C	K	E
W_1	1.000												
W_2	0.013	1.000											
A	-0.015	0.047	1.000										
B	0.055	-0.035	0.036	1.000									
L	0.046	-0.042	0.351	0.207	1.000								
X	-0.085	0.083	-0.062	-0.092	0.002	1.000							
F	-0.036	-0.020	0.061	-0.012	-0.067	0.063	1.000						
S	-0.006	-0.016	0.018	0.049	-0.016	-0.110	-0.003	1.000					
H	0.275	0.150	-0.064	-0.001	0.051	-0.221	-0.066	0.009	1.000				
G	-0.058	-0.106	0.012	0.009	-0.012	-0.129	-0.075	0.140	-0.009	1.000			
C	0.069	0.066	0.148	-0.045	0.048	-0.018	0.240	-0.060	0.140	-0.038	1.000		
K	0.017	-0.041	0.024	0.109	-0.002	-0.058	-0.039	0.310	-0.060	-0.035	-0.058	1.000	
E	0.070	0.373	0.151	-0.053	-0.098	0.021	0.001	-0.018	0.227	-0.068	0.204	-0.056	1.000

APPENDIX TABLE 17: Single Correlation Coefficient Matrix, Full-Time Households, Korea, 1969

	W_1	W_2	A	B	L	X	F	S	H	G	C	K	E
W_1	1.000												
W_2	0.039	1.000											
A	-0.016	0.015	1.000										
B	0.056	0.002	0.044	1.000									
L	0.036	0.067	0.405	0.197	1.000								
X	-0.088	0.049	-0.105	-0.111	0.009	1.000							
F	-0.118	-0.121	0.017	-0.019	-0.014	0.146	1.000						
S	-0.010	-0.018	0.014	0.060	-0.035	-0.117	0.050	1.000					
H	0.315	0.296	-0.038	0.046	0.093	-0.211	-0.162	0.194	1.000				
G	-0.068	-0.101	0.042	0.004	-0.068	-0.088	-0.104	0.205	0.003	1.000			
C	0.083	0.141	0.166	-0.018	0.120	-0.018	-0.039	-0.038	0.160	-0.025	1.000		
K	0.169	-0.031	-0.019	0.082	-0.032	-0.074	-0.025	0.009	-0.024	-0.026	-0.078	1.000	
E	0.155	0.379	0.183	0.002	0.154	-0.075	-0.124	-0.004	0.265	-0.014	0.240	-0.036	1.000

APPENDIX TABLE 18: Simple Correlation Coefficient, Part-Time Households, Korea, 1969

	W_1	W_2	A	B	L	X	F	S	H	G	C	K	E
W_1	1.000												
W_2	-0.027	1.000											
A	-0.022	0.123	1.000										
B	0.035	-0.062	0.000	1.000									
L	-0.108	-0.034	0.170	0.156	1.000								
X	-0.113	0.154	0.137	0.021	0.073	1.000							
F	-0.092	-0.043	0.138	0.004	-0.102	0.082	1.000						
S	0.125	0.026	0.061	-0.103	0.029	0.050	-0.040	1.000					
H	0.192	-0.054	-0.154	-0.158	-0.054	-0.275	-0.089	-0.019	1.000				
G	-0.022	-0.080	-0.155	-0.025	0.072	-0.345	-0.127	-.041	0.062	1.000			
C	0.109	-0.057	0.110	-0.106	-0.090	-0.033	0.420	0.114	0.082	-0.045	1.000		
K	-0.029	-0.019	0.195	0.197	-0.030	0.024	-0.057	0.062	0.164	-0.141	0.019	1.000	
E	0.065	0.244	0.244	-0.017	0.187	-0.012	-0.120	-0.095	0.241	0.061	0.115	0.060	1.000

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